Multi-Purpose Simulator

What is it?

What is the Multi-Purpose Simulator (MPS)

- The Multi-Purpose Simulator is a PC based hardware platform used to run various software packages that can generate and receive data.
- It consists of a passive backplane rack mounted PC.
- It can communicate either through serial or IP interfaces.

MPS Interfaces

- Serial Data
  - AVTEC AT-HSIO Card
  - AVTEC Monarch Card
  - ICS Fastcomm Serial Interfaces
- Network Interface
  - Standard 10/100 Network Interface

Serial Interfaces

- AVTEC AT-HSIO Card
  - Supports bits rates up to 2.5 Mbps
  - Supports various output codes
  - ISA based
  - RS 422 or TTL interface
  - Supports internal or external timing

Serial Interfaces

- AVTEC Monarch
  - Supports bits rates up to 15 Mbps
  - Supports various output codes
  - PCI based
  - RS 422 or TTL interface
  - Supports internal or external timing

Serial Interfaces

- ICS Fastcomm Serial Interface Card
  - Supports bits rates up to 2.5 Mbps
  - Supports various output codes
  - PCI based
  - RS 422 interface
  - Supports internal or external timing

AVTEC AT-HSIO

- Advantages
  - Proven Technology
  - Very Reliable
- Disadvantages
  - ISA based – This will limit the machines available for use
  - AVTEC is stopping production.

AVTEC Monarch

- Advantages
  - PCI based
  - Fast
  - Very Reliable
- Disadvantages
  - High Cost – This card costs $8,000 for the base version and $15,000 for the full version

ICS Fastcomm Serial Interface

- Advantages
  - Inexpensive – Each card costs only $500
  - PCI Based
- Disadvantages
  - RS 422 only
  - Not designed to be a true frame sync
  - Not all clock rates are supported.
  - Minimum generated clock rate is 900 bps.

Current MPS Configuration

- Passive Backplane Pentium 3 based PC
- 2 ISC Fastcomm Serial Interface Cards
- 2 AVTEC AT-HSIO Interface Cards
- 10/100 base T network Connection
- 15” LCD Flat Panel Monitor
- CD-RW

MPS Operating Systems

- The MPS can use the following operating systems
  - Microsoft Windows NT with Service Pack 6a
  - Microsoft Windows 2000
  - Microsoft Windows XP
    - Note - Only supports IP communication
  - Linux (Future Implementation)

Scalable, Integrated, Multi-mission Simulation Suite (SIMSS)

- What Is SIMSS?
- SIMMS is a modular based simulation suite.
- It is designed to allow the user to manipulate data.
- It is designed to allow for easy upgrade as additional requirements are identified.

Components of SIMSS

- SIMMS consists of two components
  - Server
  - Client

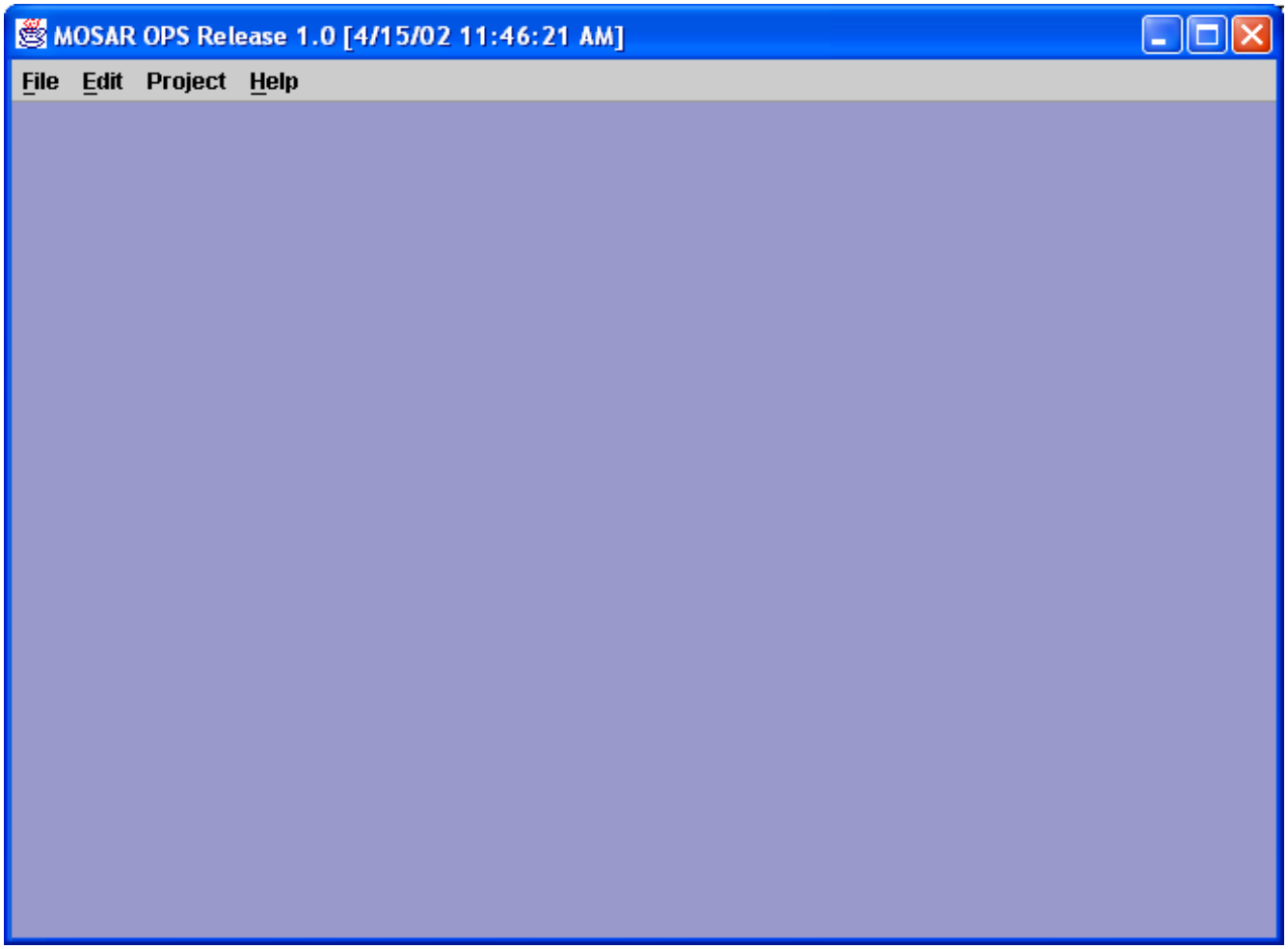
SIMSS Server

- The Server component runs on a PC running Windows NT or Windows 2000. This PC can have Serial Interface Cards in the system.

SIMSS Client

- The Client component can run on a Windows PC. It can run on either the same machine as the Server component or it can run on another PC connected via a LAN to the Server PC.
- The Client is the User Interface
- The Client is Java based

Client Interface Screen



SIMSS Projects / Modules

- The User Interface consists of Projects and Modules
- Projects
  - A Project is a collection of Modules required to perform a logical task
- Modules
  - Modules are the individual components that are designed to perform a specific function.

Module Basics

- Modules can have up to 3 Input Channels and 3 Output Channels. These are used to provide the Software Link between the modules.
- Modules fall into three basic types
  - Run Time Configurable : These can be configured while the module is running.
  - Non-Run Time Configurable: These modules require the module to be stopped prior to any configuration changes.
  - No Configuration Required: These modules are designed for a specific task and require no configuration

Modules

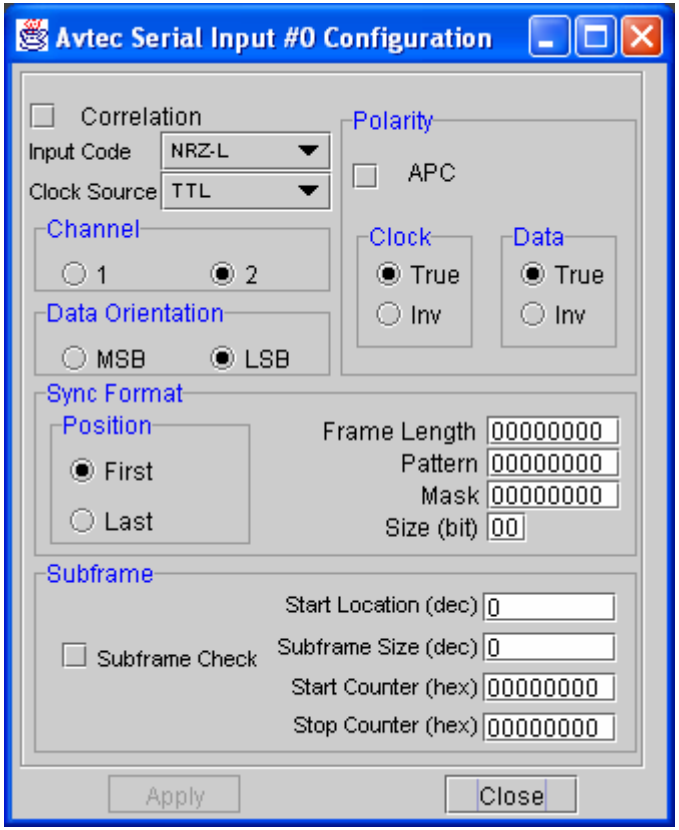
- Modules can be broken down to several categories.
  - Interface Modules
  - Data Generation Modules
  - Data Evaluation Modules
  - Data File Handling Modules
  - Data Manipulation Modules

Interface Modules

- The following Modules provide an Interface from the MPS to external machines.
  - AVTEC Serial Input
  - AVTEC Serial Output
  - Input IP
  - Output IP
  - Serial Output
  - Serial Input

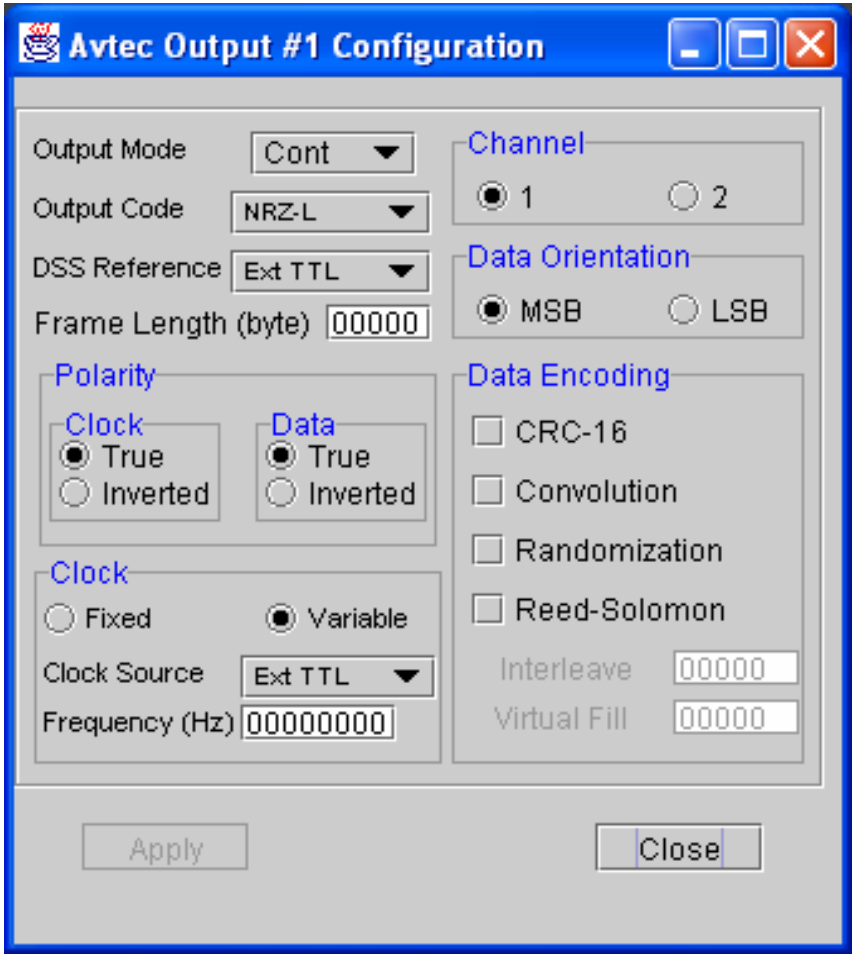
AVTEC Serial Input

- The AVTEC Serial input Module can receive data either 422 or TTL.
- It is user configurable to set for any frame length, up to 4096 bytes



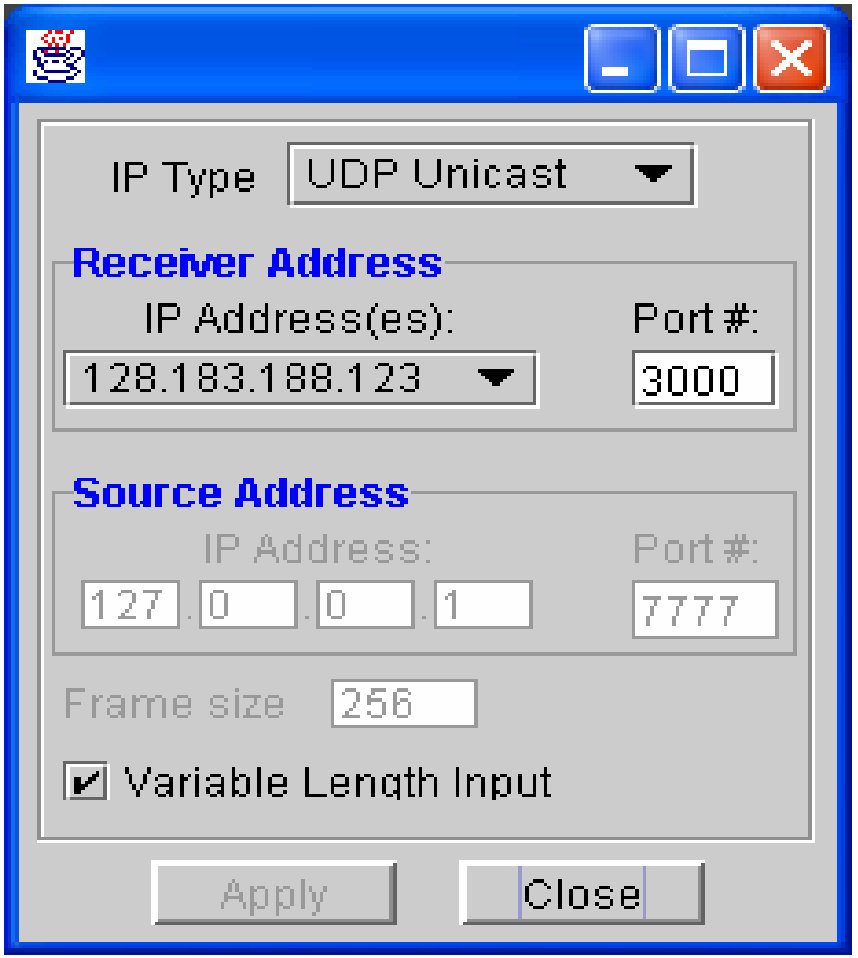
AVTEC Serial Output

- The AVTEC Serial Output Module can output data either 422 or TTL.
- It can send various output codes.
- It supports Frame Lengths up to 4096 bytes.



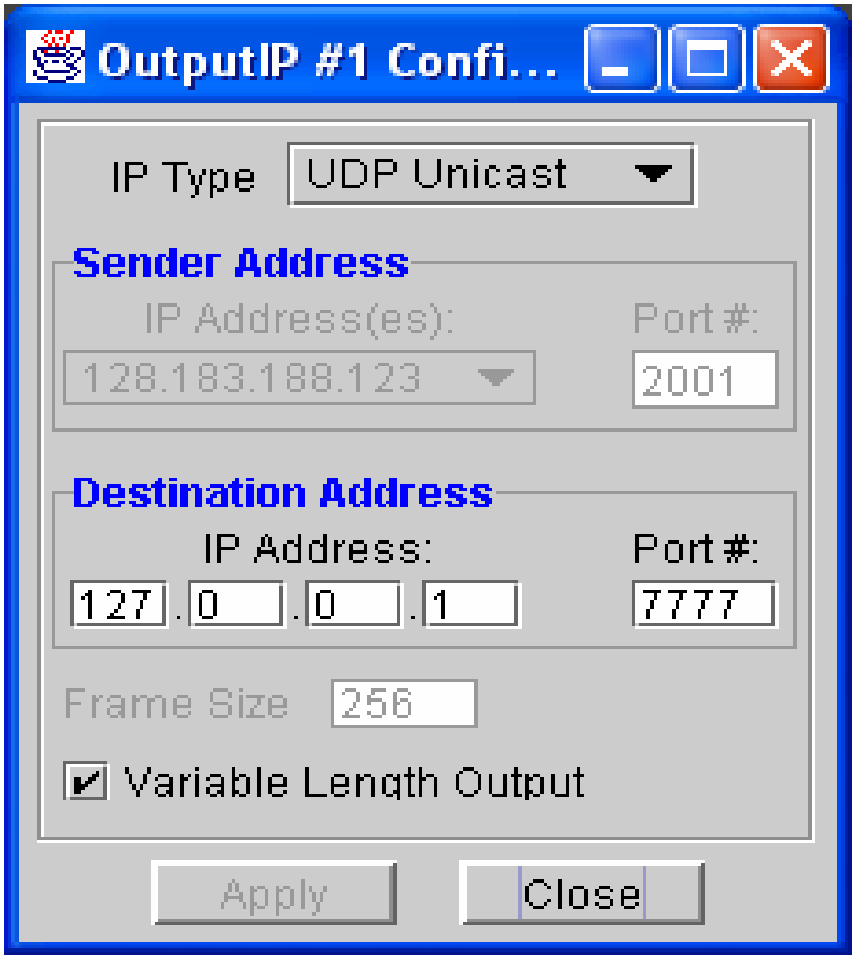
Input IP

- The Input IP module can receive TCP/IP, Unicast, or Multicast UDP Packets.
- It can receive variable or fixed length packets.
- It can act as either a TCP/IP Client or Server



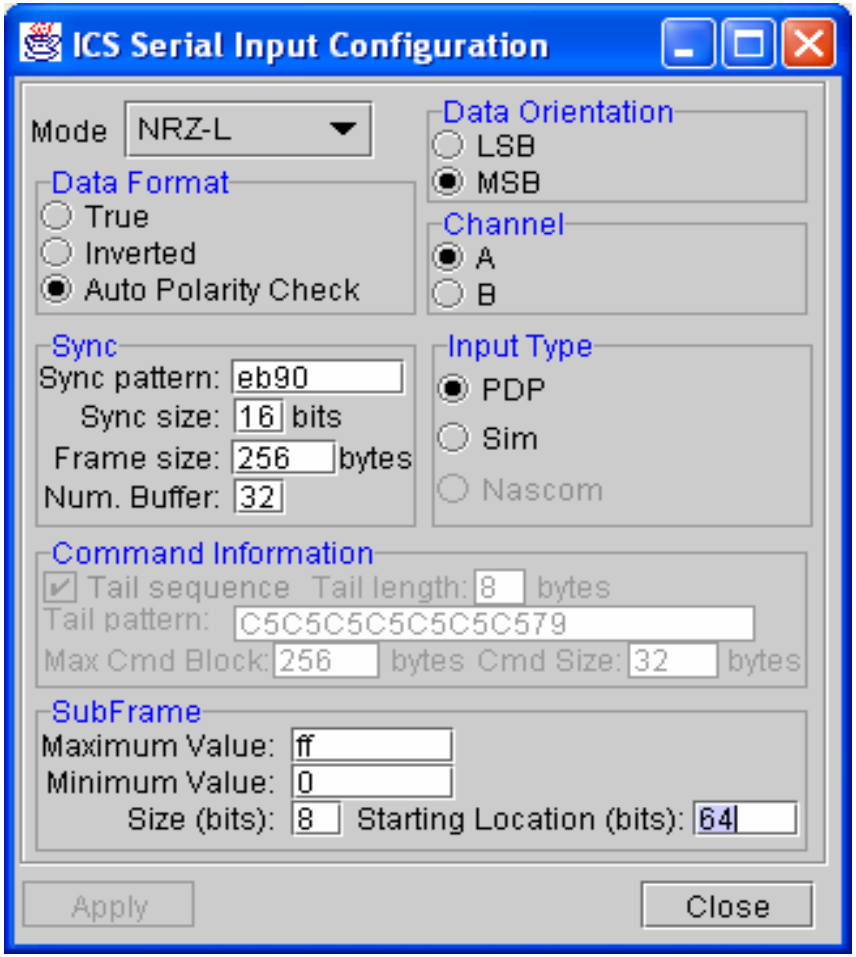
Output IP

- The Output IP Module can output TCP/IP, Unicast, and Multicast Packets
- It can output fixed or variable length packets
- It can act as a TCP/IP Server or Client



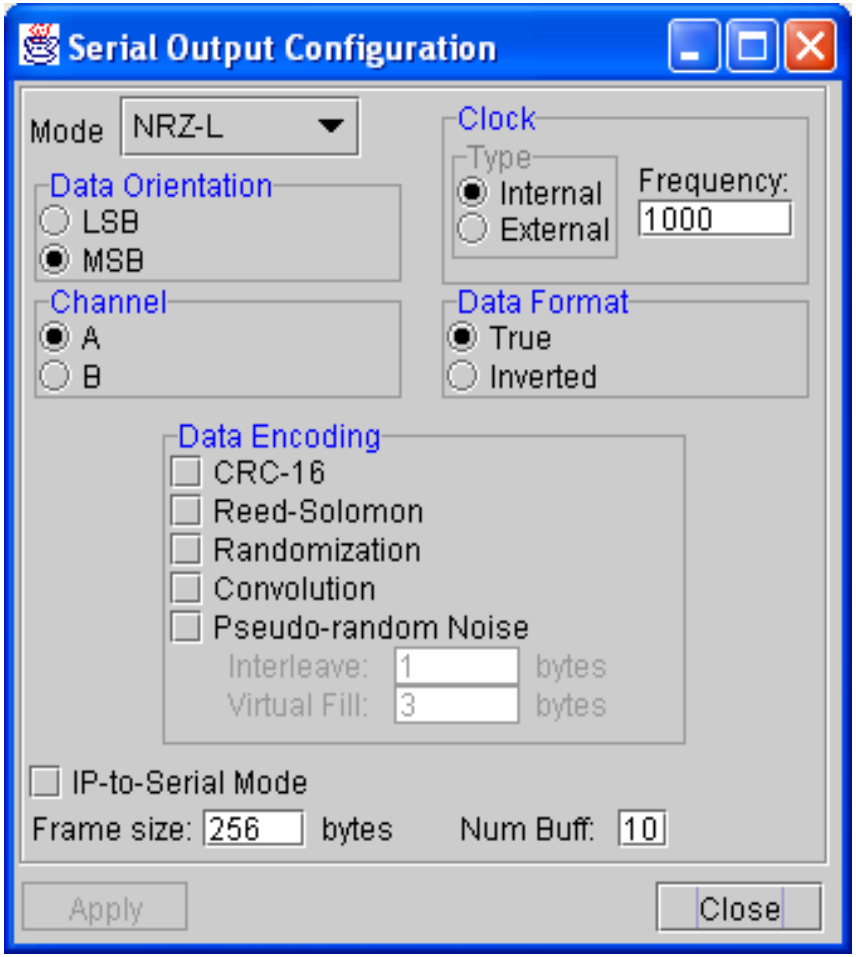
Serial Input Module

- This module is used to input data via an RS-422 Interface.
- It can handle frame lengths up to 4096 bytes.



Serial Output Module

- This module is used to output data via an RS-422 Interface.
- This module can handle frame lengths up to 4096 bytes.
- This module can output various codes of data

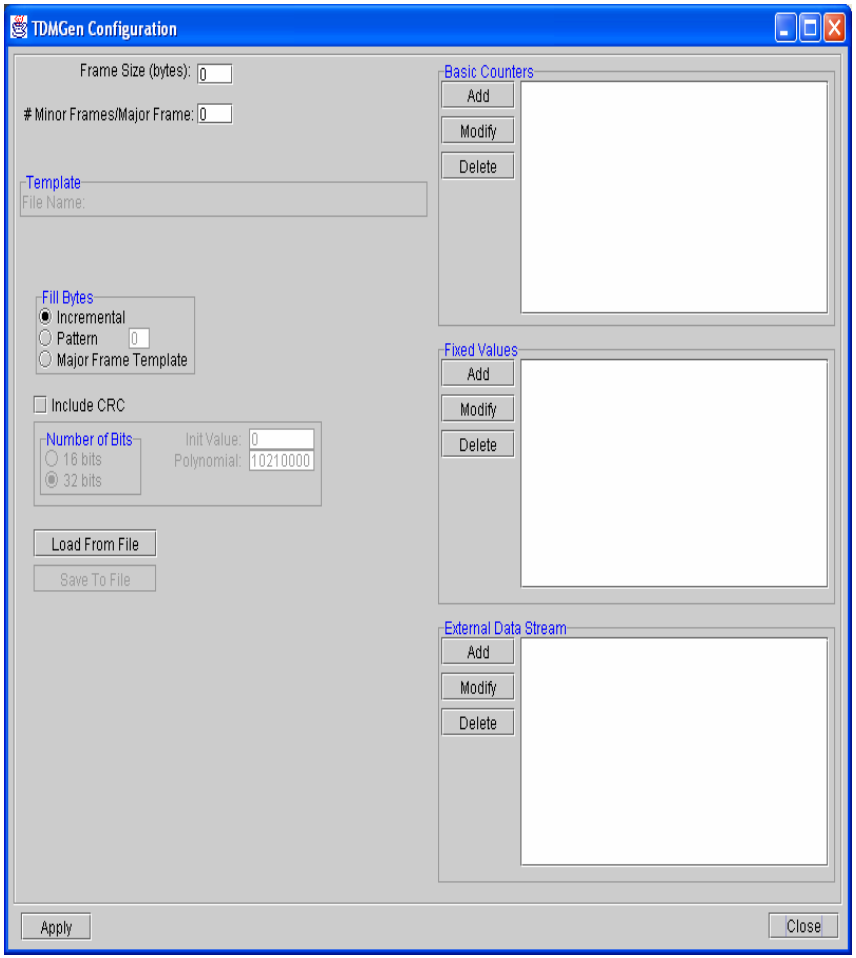


Data Generation Modules

- The following modules are used to generate data.
  - TDMGEN
  - TDMCMDGEN
  - GENTLM
  - CMDXMIT
  - JSC Voice Pattern

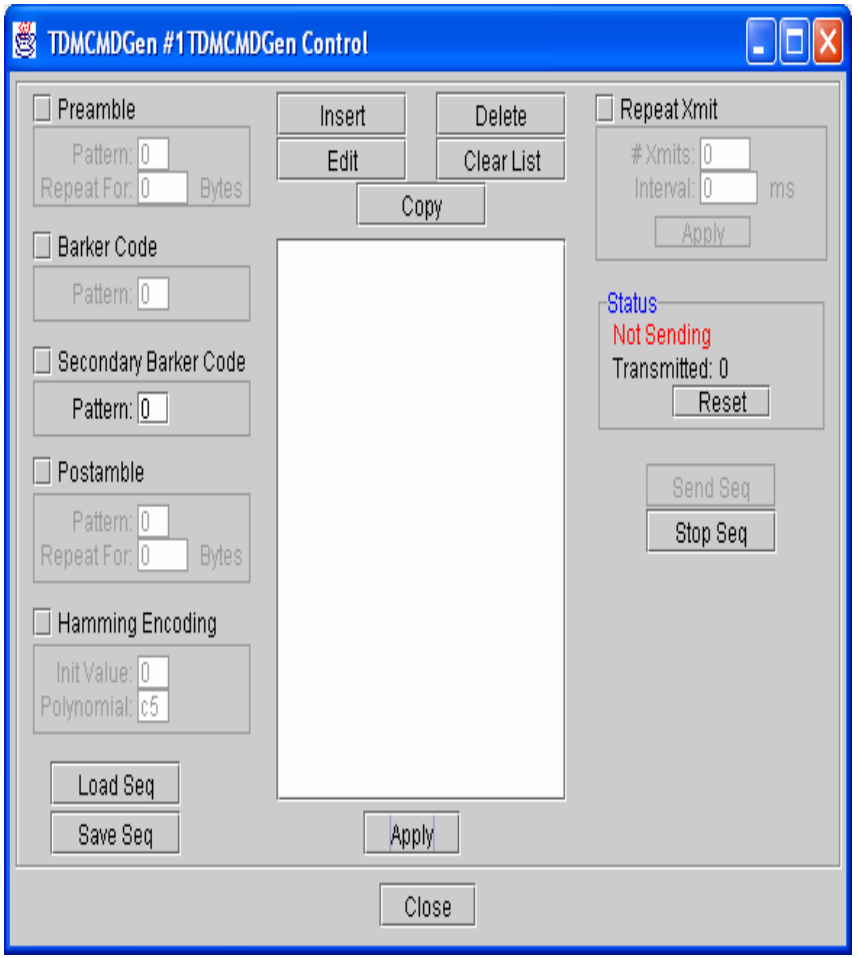
TDMGEN

- This module can be used to generate a TDM Stream of Telemetry data.
- It can insert counters
- It can insert frame sync patterns
- It can insert a major frame of data from a file stored on disk.
- It can receive data from other modules to be muxed into a stream of data.



TDMCMDGEN

- This module can generate TDM style commands.
- It can insert Preamble, Barker Codes, Postamble, and calculate the hamming code.
- It can save and retrieve commands from a disk.

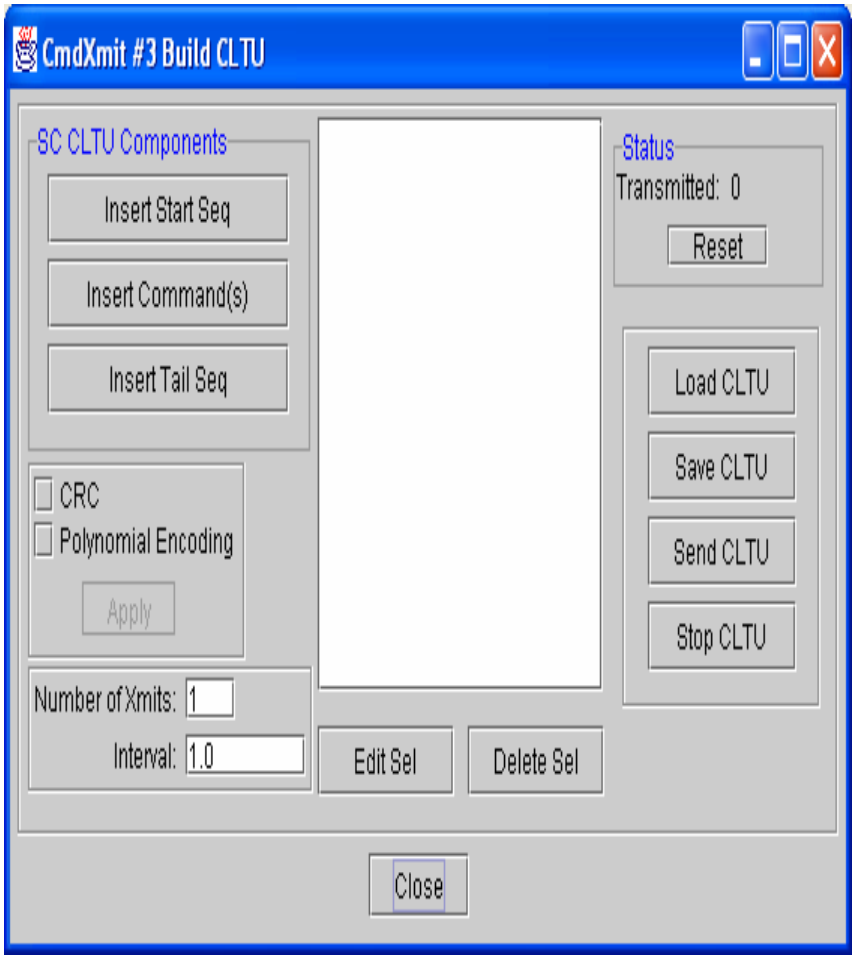


GENTLM

- This module is used to generate CCDS data.
- This module is currently being reviewed. It is not fully supported in this release.

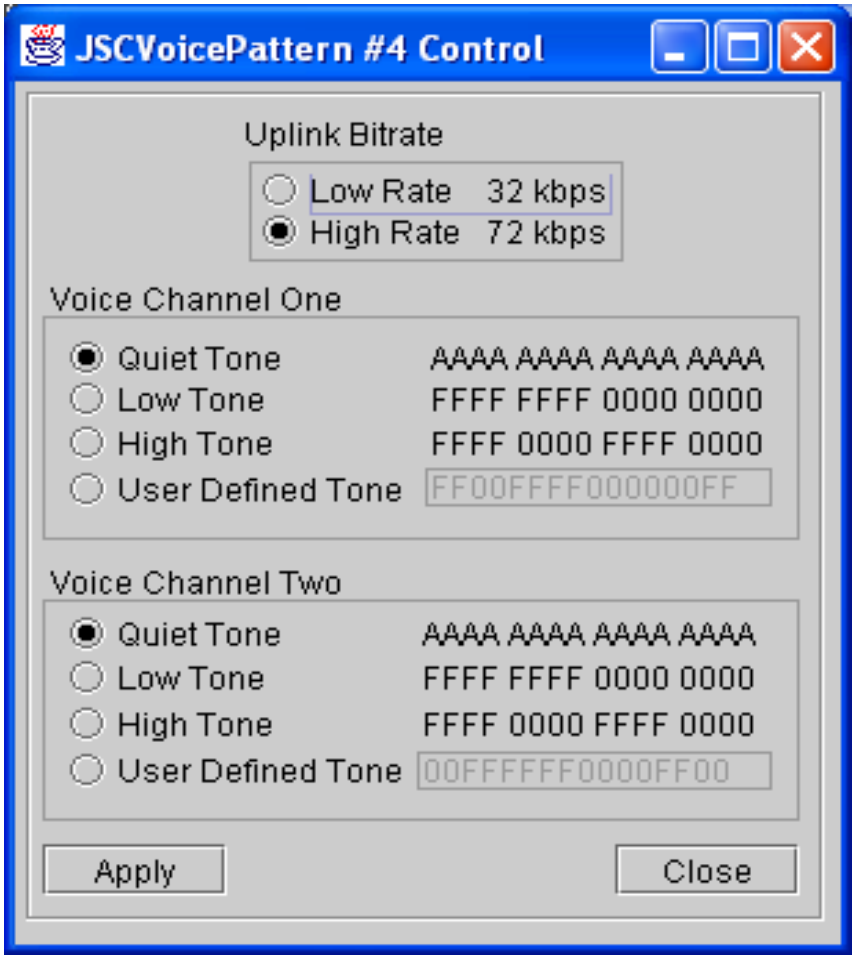
CMDXMIT

- This module is used to build CCSDS style of commands.
- It allows the user to build CLTU (Command Link Transmission Units)
- It allows you to load and save CLTU's.



JSC Voice Pattern

- This module is used to supply the voice patterns for the Shuttle Uplink.
- This module's output is sent to TDMGEN to be incorporated into the orbiter uplink.



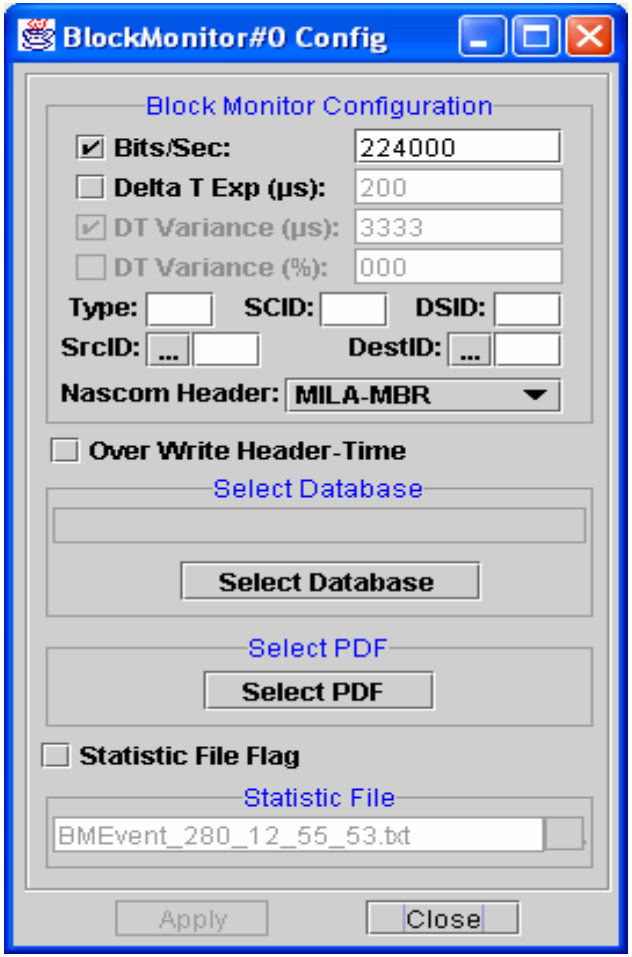
Data Evaluation Class
(Note: some of these modules may also fall into other classes)

- Block Monitor
- Frame Monitor
- Frame Monitor Shuttle
- Generic Command Ingest
- Generic Command Validation
- NASCOM Monitor
- Monitor
- Packet Processor

- Shuttle Command Echo
- Site Status
- TDRSS Checksum
- Track Monitor
- TDM Cmd Ingest
- TDM DQM
- VC Processor

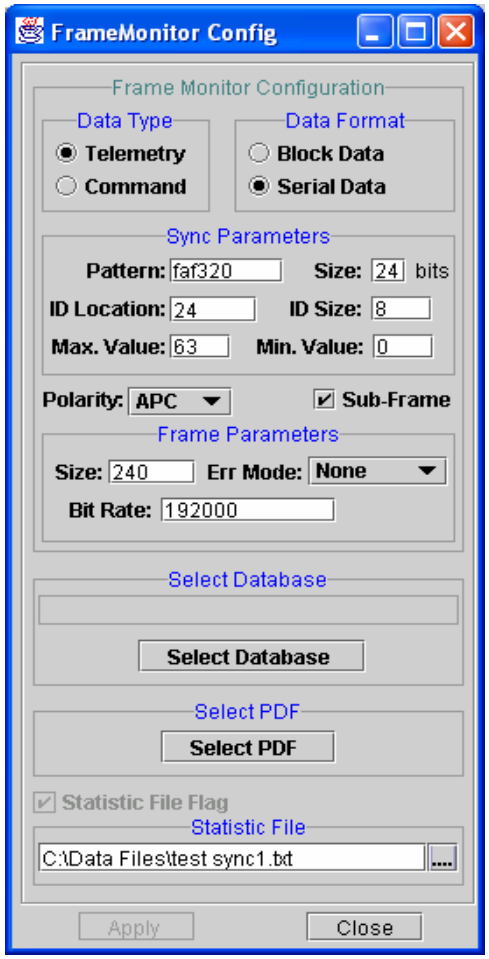
Block Monitor

- This module is used to verify a NASCOM Block
- It can filter on any of the following items
  - Message Type
  - Spacecraft ID
  - Source
  - Destination
  - Data Stream ID
- It has deblocked outputs and blocked outputs



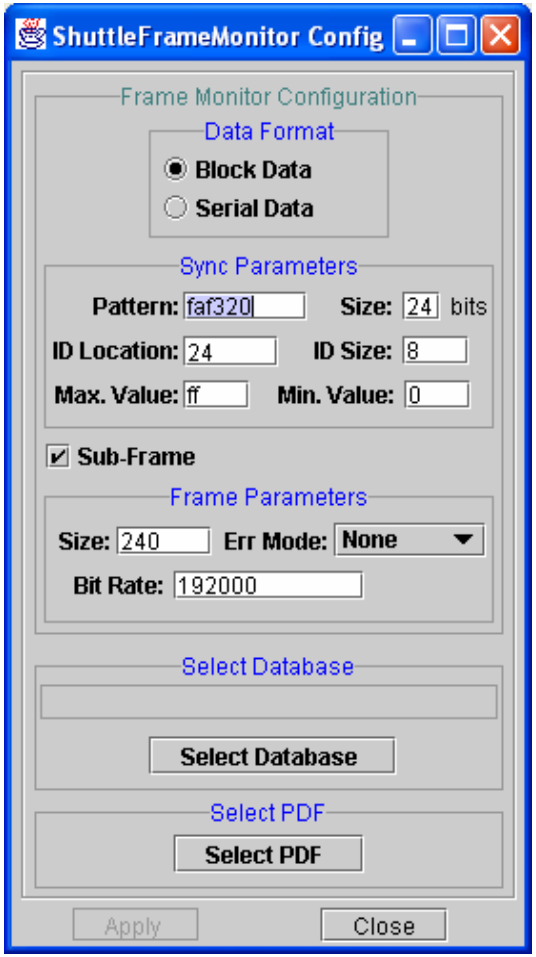
Frame Monitor

- This monitor is used to synchronize data
- It can looks for 32 bits of sync
- It can sync on true or inverted data
- It can lock on subframe counters



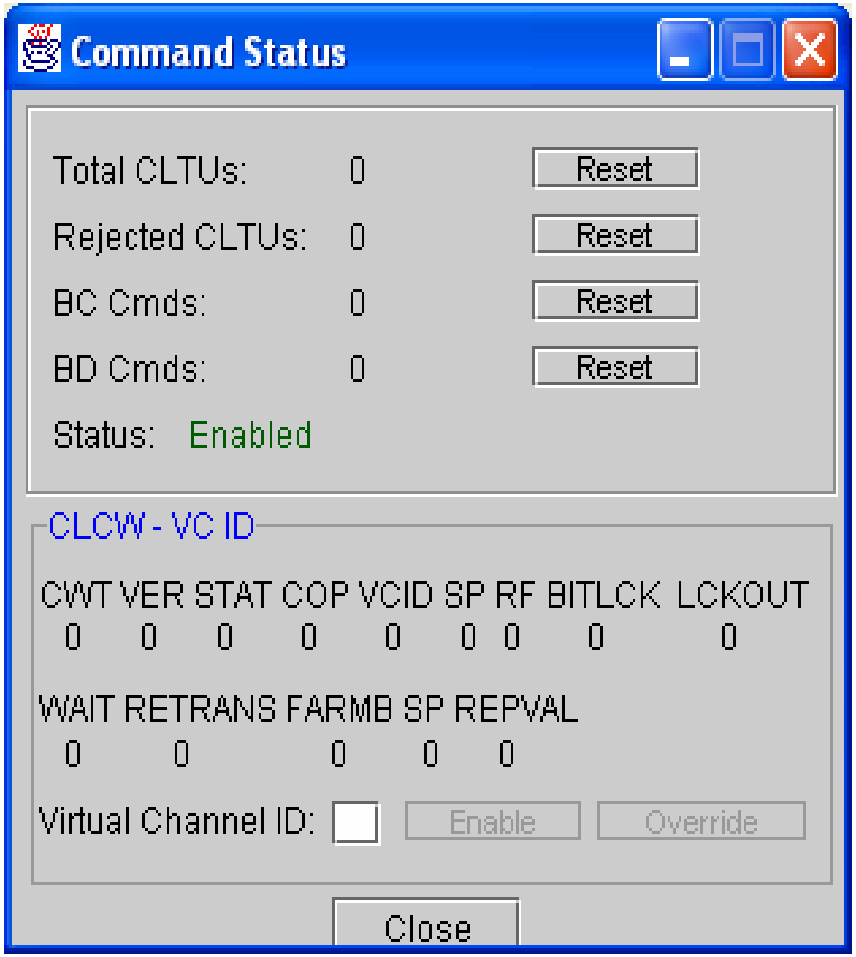
Frame Monitor Shuttle

- This module is works like the Frame Monitor
- It has the ability to display the orbiter NSP status.
- It also displays the source and destination if it is receiving block data.



Generic Command Ingest

- This module is used to receive CCSDS style of commands
- This module can output Command Link Control Words



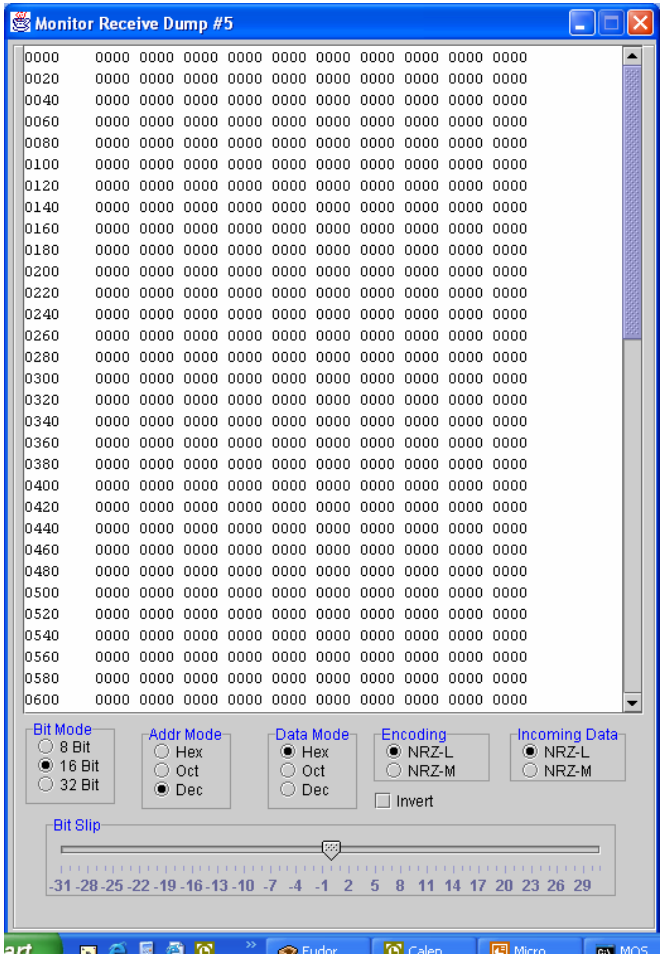
Generic Command Validation

NASCOM Monitor

- This module verifies the RTP header on a incoming IP packet
- It will also display the header information on incoming NASCOM Blocks
- This is useful when you have multiple streams on the same line.

Monitor

- This module is a troubleshooting aid
- It allows the user to exam raw data and bit shift it to the right or left.
- It allows the user to invert the data and code convert for NRZ-L to NRZ-M and back

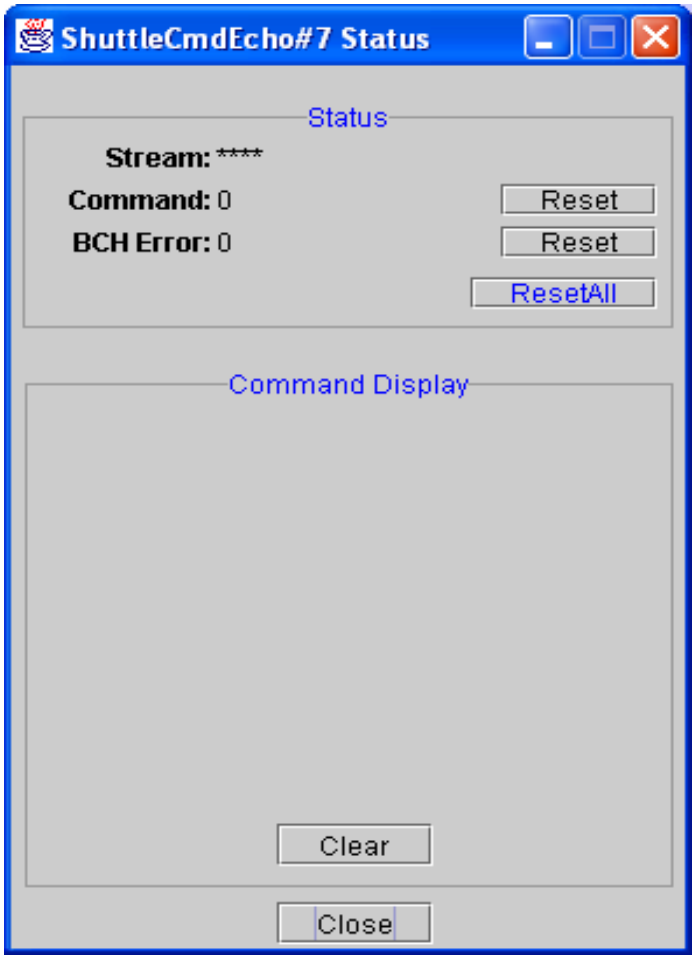


Packet Processor

- This module can receive CCSDS Packets
- It can output selected packets to other modules

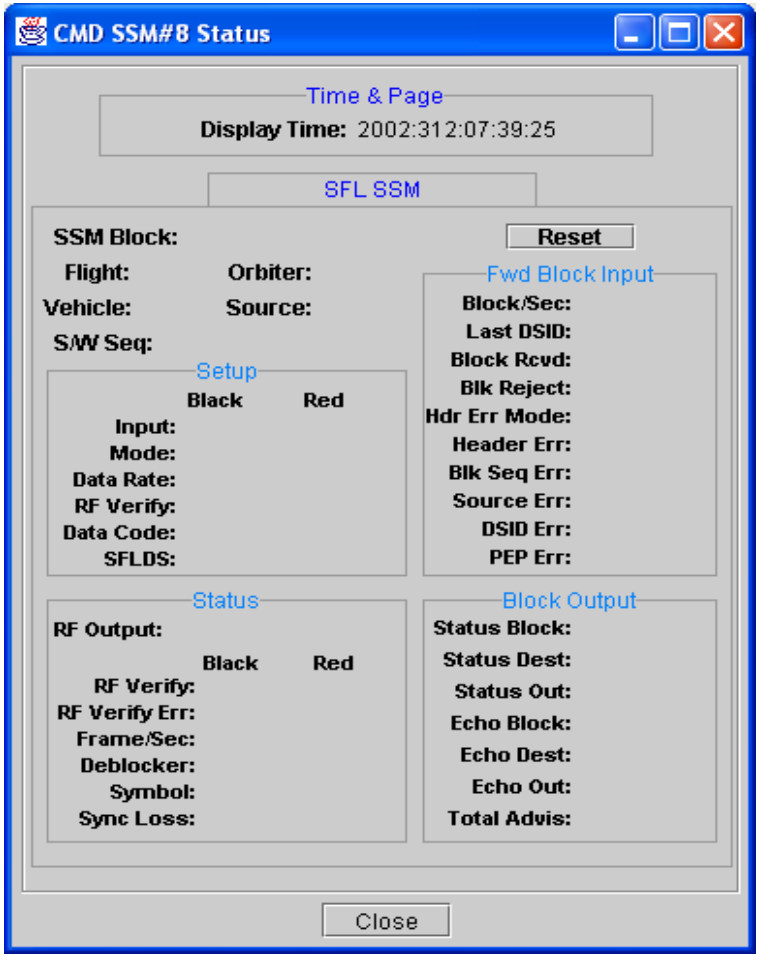
Shuttle Command Echo

- This module accepts a synchronized clear text 72 or 32 kbps orbiter uplink.
- It extracts the command from the command slots and performs a BCH error check
- It outputs the BCH decoded command



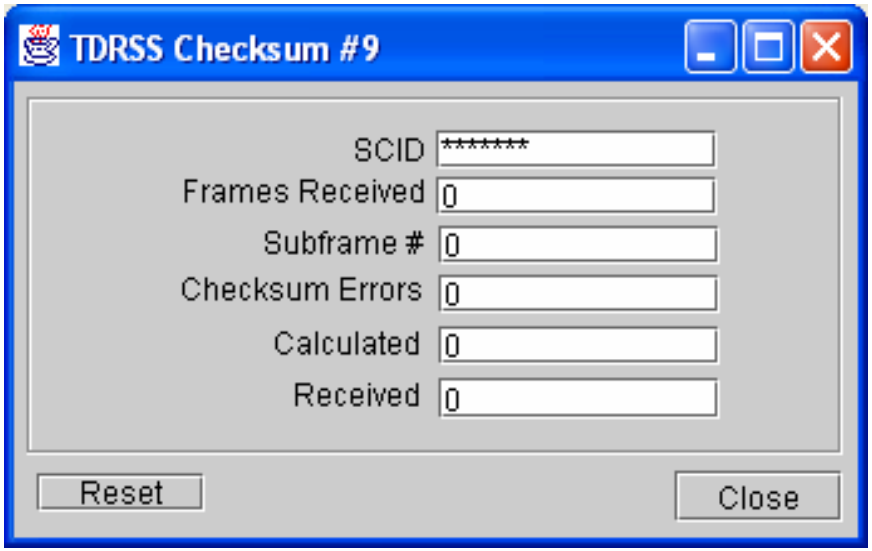
Site Status

- This module displays the site status messages.



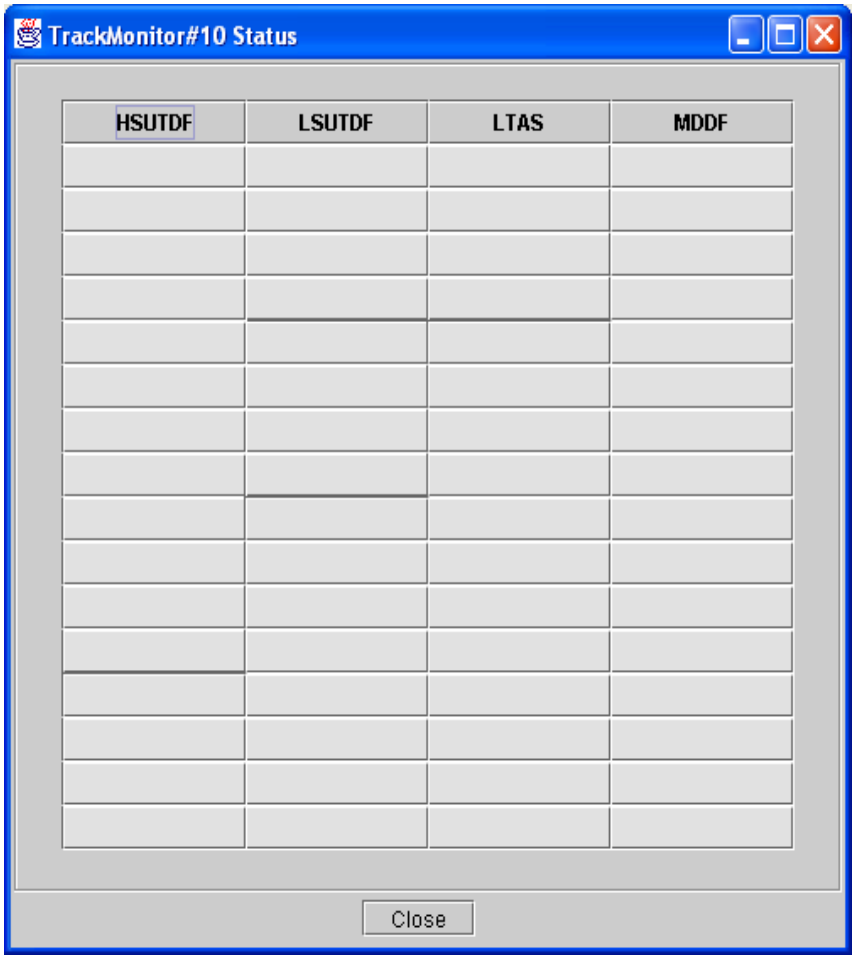
TDRSS Checksum

- This module receives a synchronized stream of TDRSS 1 kbps or 4 kbps telemetry
- It performs a CRC check on the data



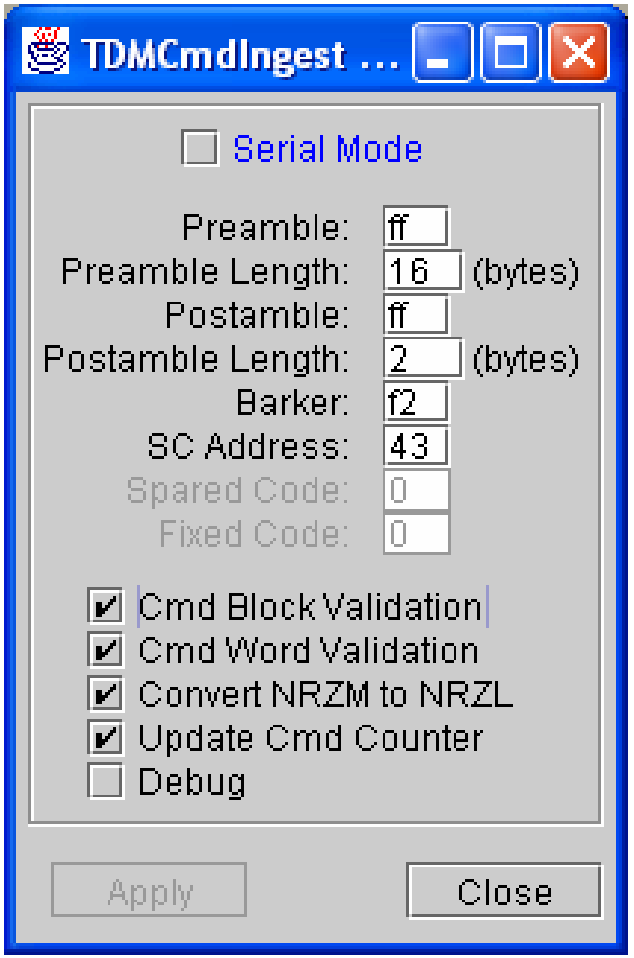
Track Monitor

- This module can receive either NASCOM Blocks or TTY Tracking data
- It can display the source of the data
- It can display the following
  - HSUTDF
  - LSUTDF
  - LTAS
  - MDDF



TDM CMD Ingest

- This module is used to validate TDM style of commands
- It outputs information to other modules to update command counters and command words

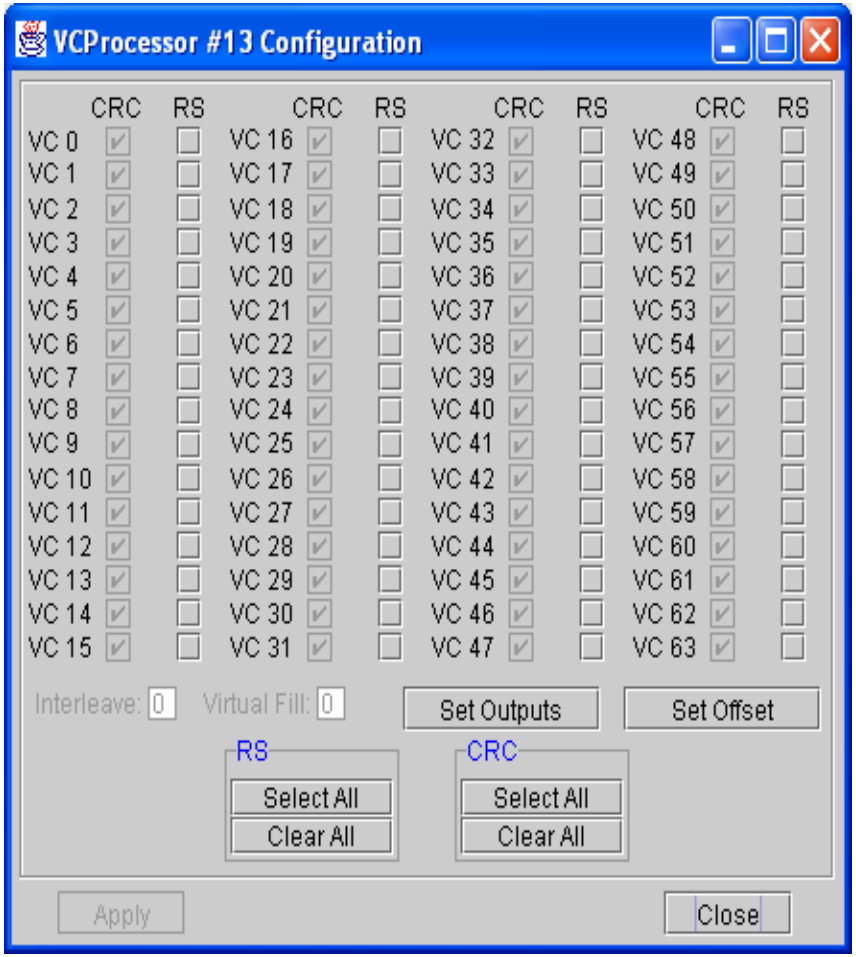


TDM DQM

- This module is used to evaluate TDM data
- It can look for sync and subframe counters
- It can extract minor frames or bytes of data
- It has 3 outputs to send the extracted data to other modules

VC Processor

- This module receives CCSDS data
- It processes the Virtual Channels and outputs selected channels

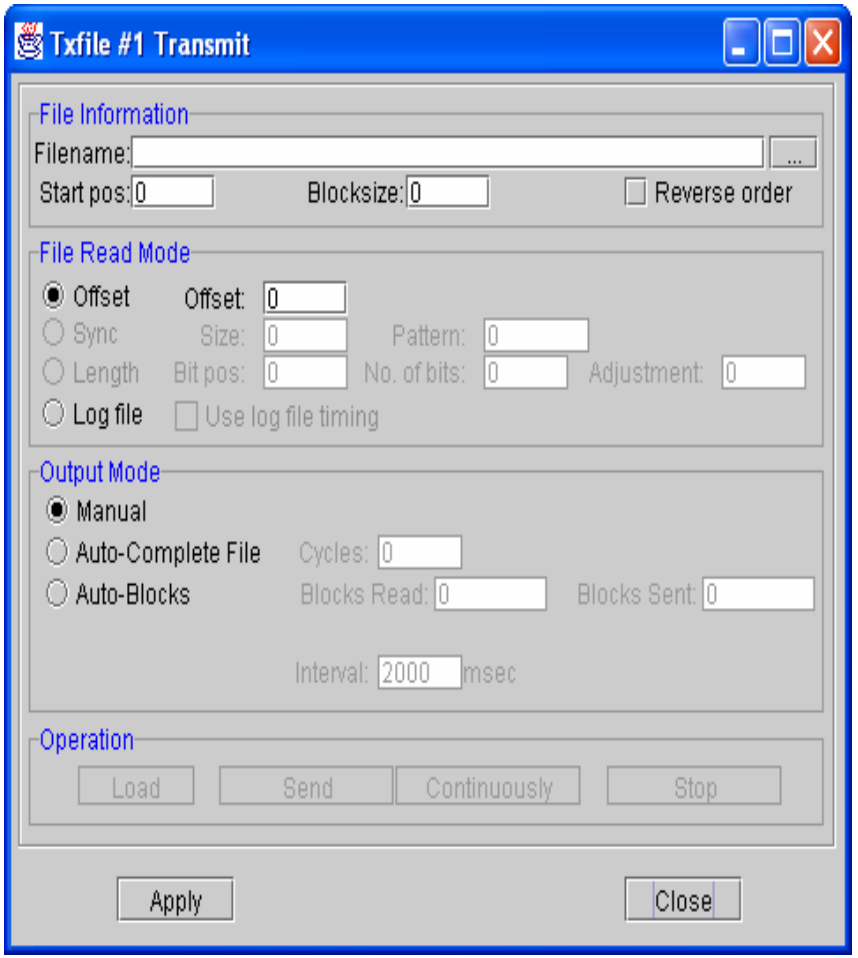


Data File Handling Modules

- These modules allow the user to store or retrieve data to a disk or CD.
  - TXFILE
  - LogModule

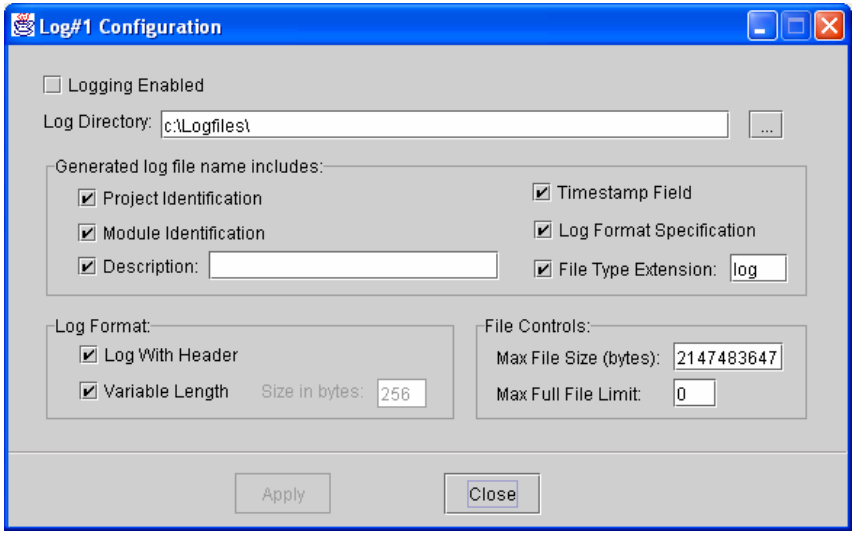
TXFILE

- This module allows the user to select a file from any disk in the system.
- It allows the data to be transmitted in multiple different modes



LogModule

- This module allow the user to store data on any disk drive in the system that the user has write access.
- It can log with a SIMSS header that allows to user to play back a burst data stream (Speed limitations do Apply)

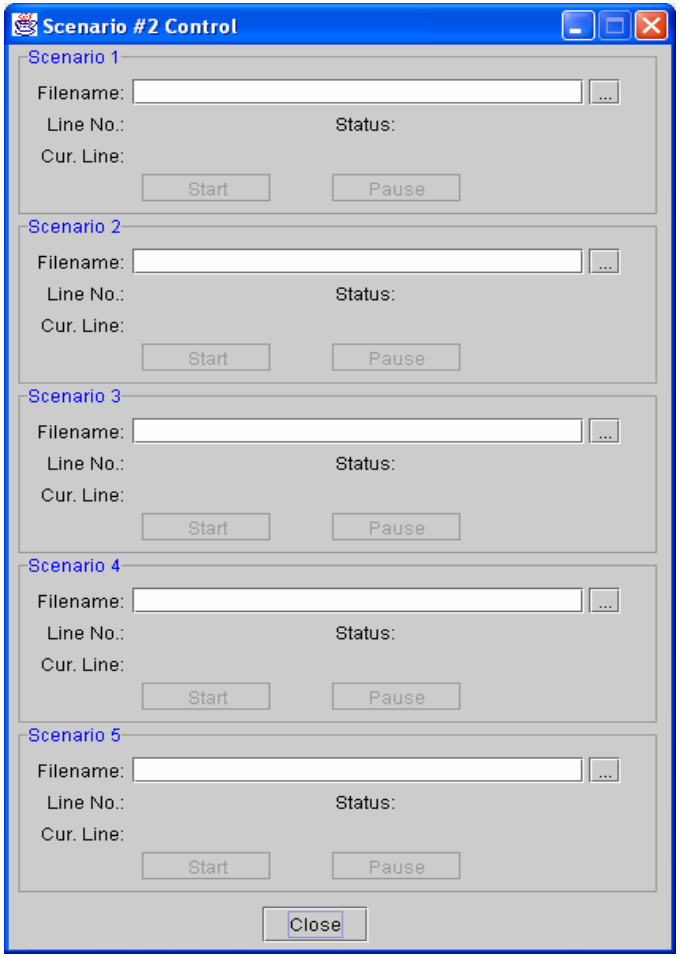


Data Manipulation Modules

- Scenario
- TDMDemux
- TlmMod
- Wrapper
- Test Module
- JSC CMD Encode

Scenario

- This module reads directives from specified scenario files line by line and passes them to down-linked modules for processing.

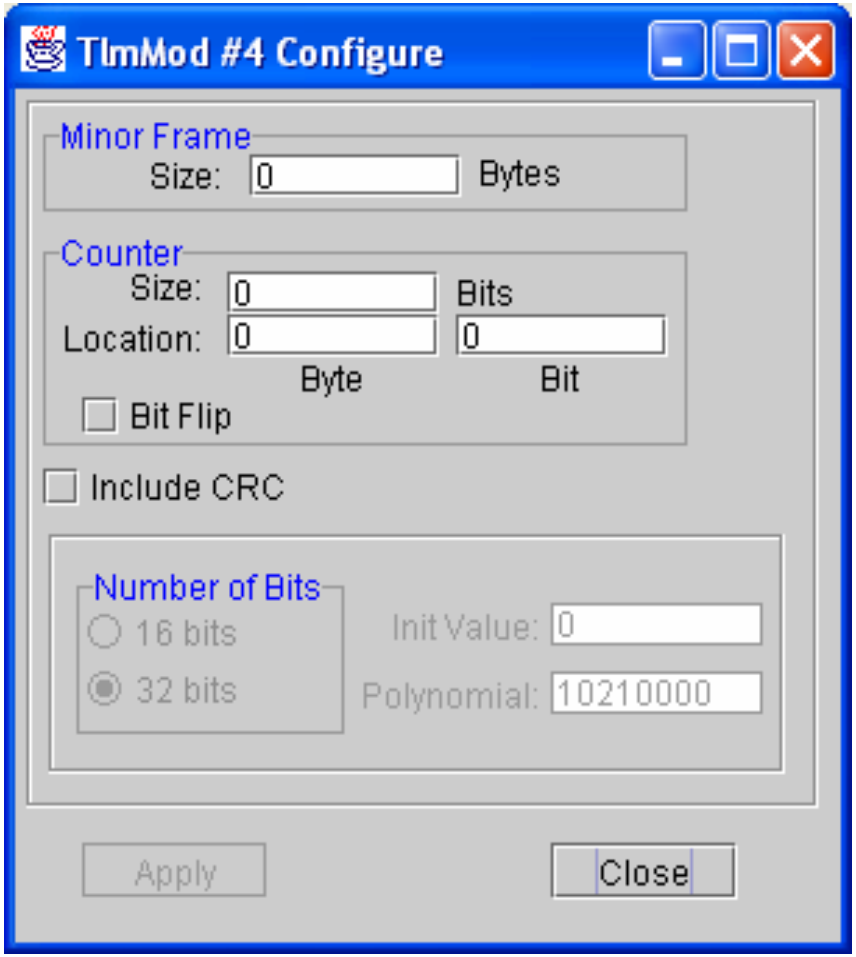


TDMDemux

- This module allows the user to extract data from a TDM stream and assemble it into a stream of data.

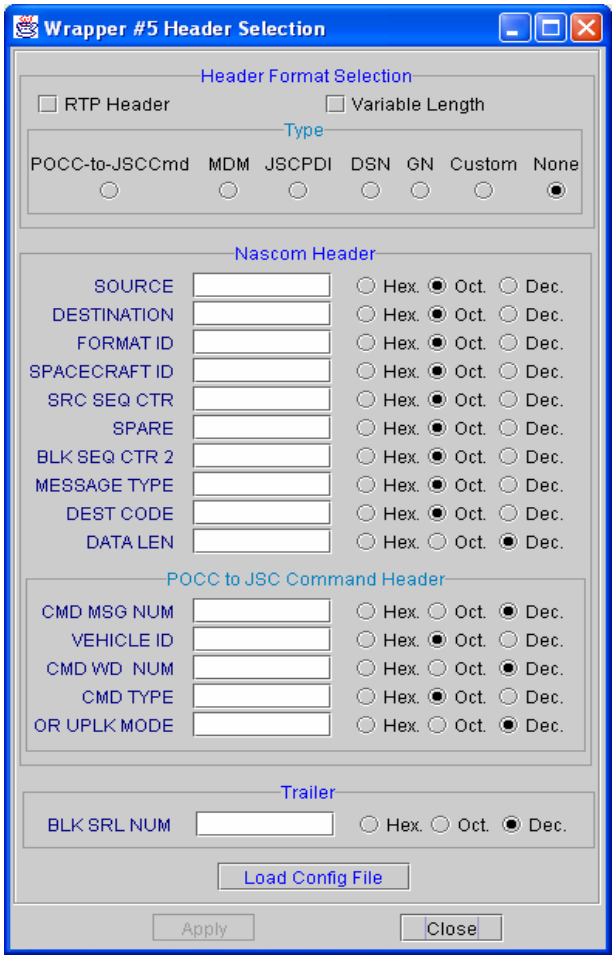
TlmMod

- This module allows the user to receive TDM telemetry stream and modify data points in the stream



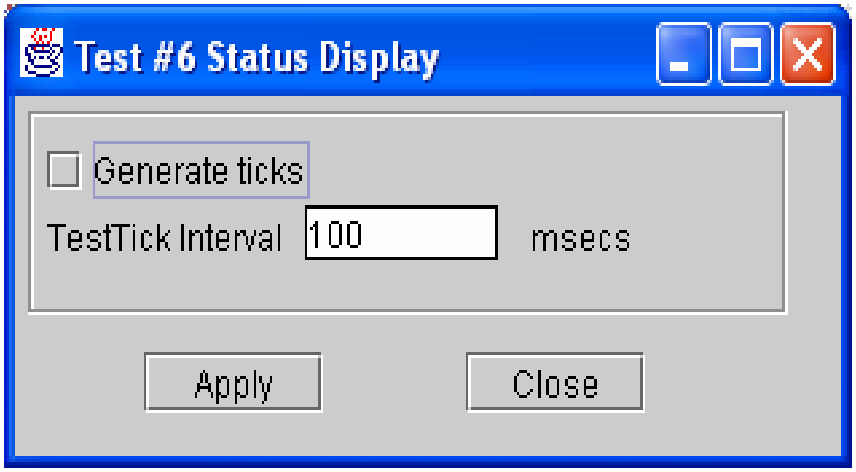
Wrapper

- This module can package data into a 4800 bit NASCOM Block
- It also allows for a RTP header to be placed at the beginning of the block for IP transmission



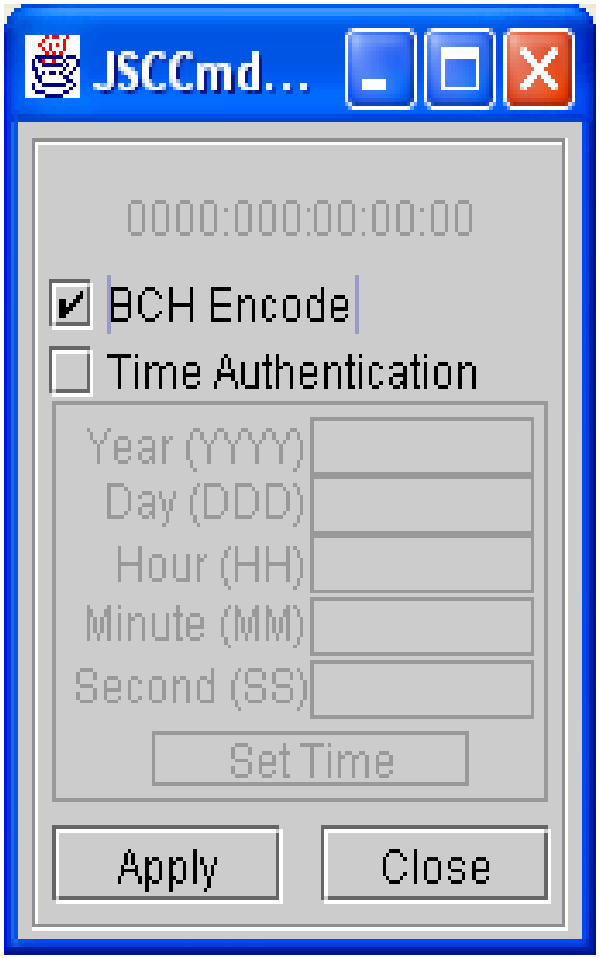
Test Module

- This module generate ticks to control the timing of other modules
- Ticks are software signals that are used to kick off events



JSC CMD Encode

- This module is used in conjunction with TDMCmdGen and TDMGem
- It accepts a 48 bit shuttle command and BCH encodes it
- It will also Time Authenticate the command



Creating a New Project

- The first step in creating a new project is to determine what modules will be required to be utilized.
- Projects need to be broken down into their logical parts
- Almost every project will look something like this

Logical Project

What is the source of the data?

What do I need to do to the data?

Where is the data going

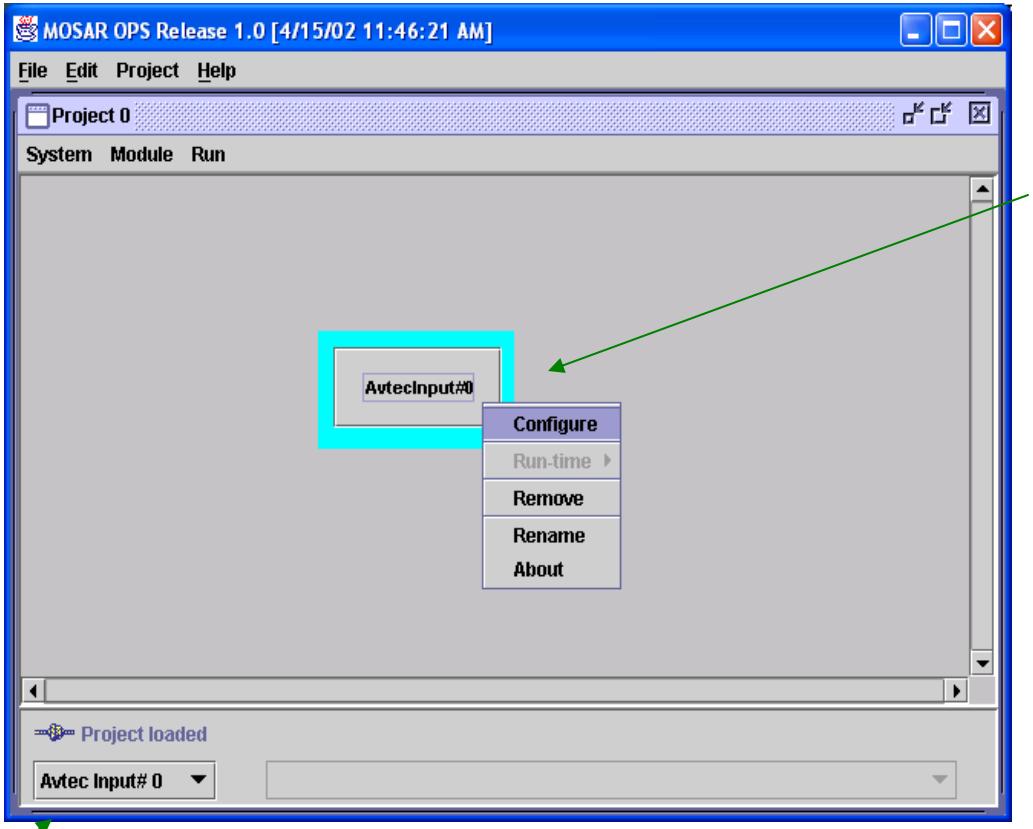
Configuring Modules

- The next step in building a project is configuring the modules
- A detailed description of each module can be obtained in either the SIMSS Users Guide or the MOSAR Users Guide.
- The following section is a brief description of the configuration of the some of the most commonly used modules

Interface Modules

- The following Modules provide an Interface from the MPS to external machines.
  - AVTEC Serial Input
  - AVTEC Serial Output
  - Input IP
  - Output IP
  - Serial Output
  - Serial Input

AVTEC Serial Input Module



Clicking on the Module will open the following window. This is used to access the configuration

This allows you to select the module for use of SET DIRECTIVES. See uses guide for these directives

The AVTEC Serial Input Module has no Input Channels and 1 Output Channel.

It is a Non-Run Time Configurable Module

AVTEC Serial Input Configuration

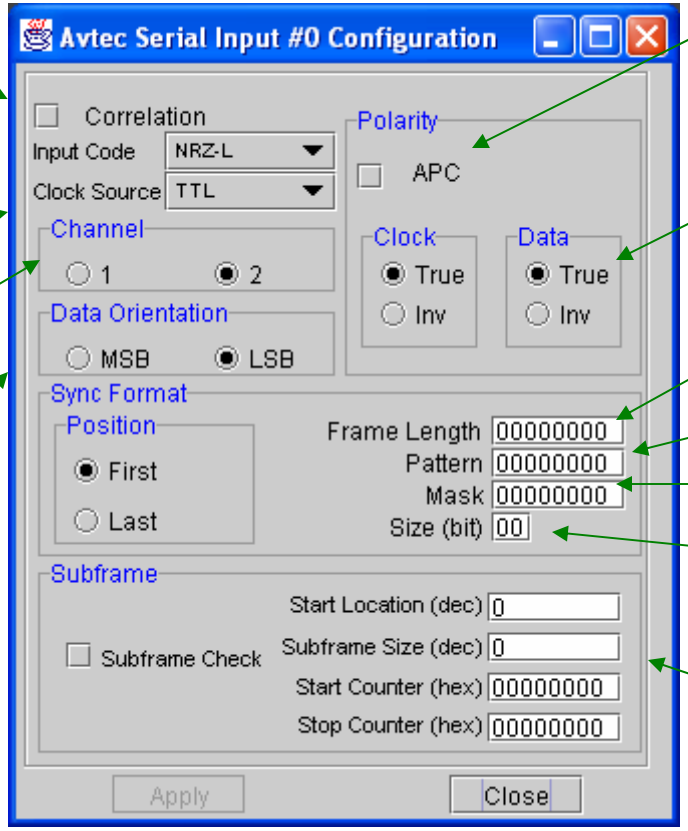
Allows the user to look for sync or just pass all data into the system

Select between NRZ-L , M , or S

Select TTL or 422 for the Source of the Data and Clock

Determines which card is to be used

These items are not yet fully implemented.



Auto Polarity Correction

Selects the Clock and data phase. If APC is **ON** these are not used

Frame Length in Bytes, Maximum is 4096

Frame Sync Pattern Maximum 32 bits

Used in conjunction with frame sync

Must be 32 bits

Used to detect SubFrame

Use Frame Monitor for this function

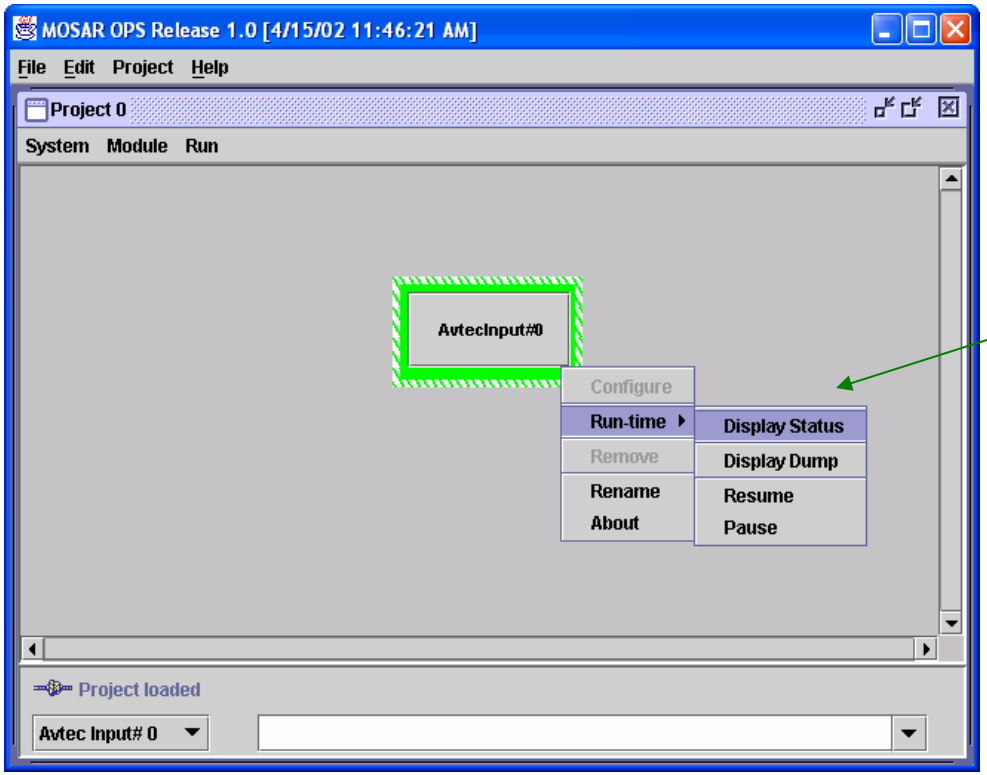
Configuring the Frame Sync in the AVTEC Serial Input

- You must enter 32 bits of information in both the Frame Sync and Mask. The Sync Length must always be set to 32 bits.
- The Frame Sync and Mask work in tandem to determine whether the data is good.
- For every bit of sync to be checked a 1 must be entered in the mask

Setting the Sync and Mask

- Example 1: Frame Sync $FAF320_{HEX}$
  - In the Frame Sync window you must enter FAF32000
  - In the Mask window you must enter FFFFFF00
- Example 2: Frame Sync $EB90_{HEX}$
  - In the Frame Sync window you must enter EB900000
  - In the Mask window you must enter FFFF0000

AVTEC Serial Input Run Time

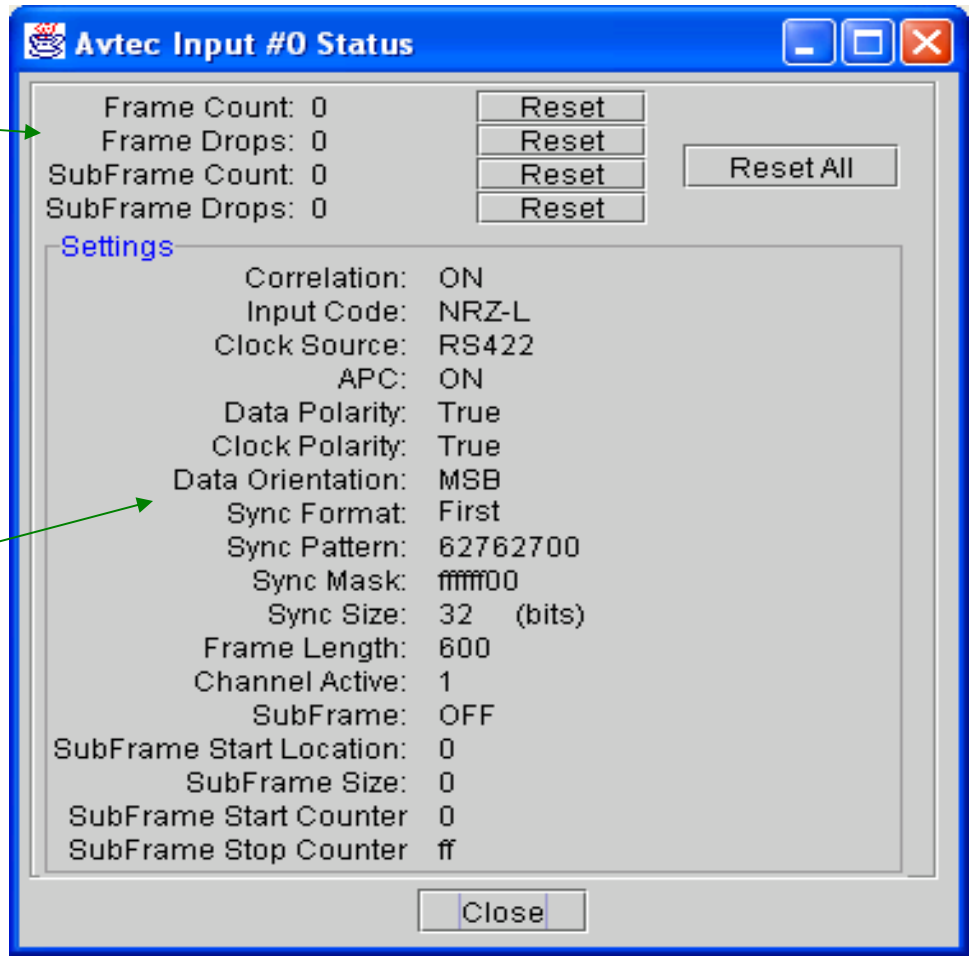


The Run Time Drop Down Windows allow the User to open the Status Window, Display the Raw Data, Stop, or restart the module

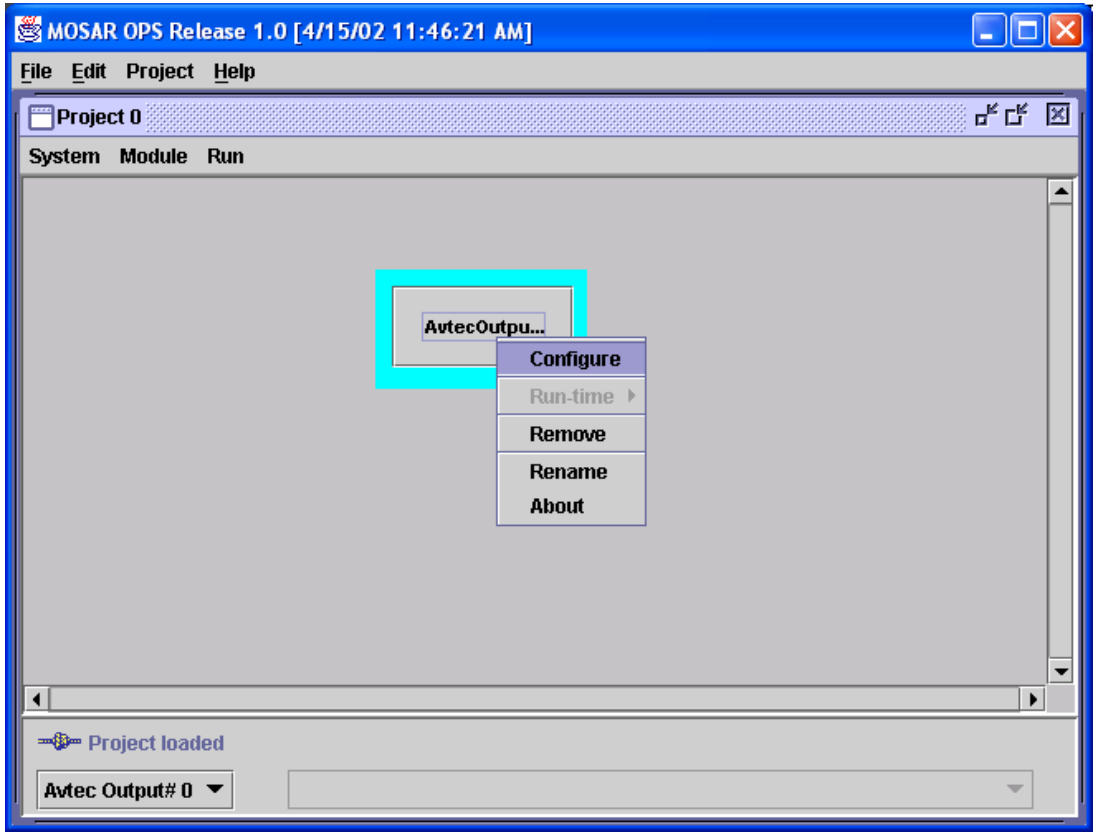
AVTEC Serial Input Status Display

Displays the frame and subframe information

Displays the configuration information



AVTEC Serial Output



The AVTEC Serial Output Module has 1 Input Channel and no Output Channels

It is a Non-Run Time Configurable Module

AVTEC Serial Output Configuration

Continuous or Burst Which works best depends on the source of the data

Selects NRZ-L,M,S or BIØ- L,M,S for Output

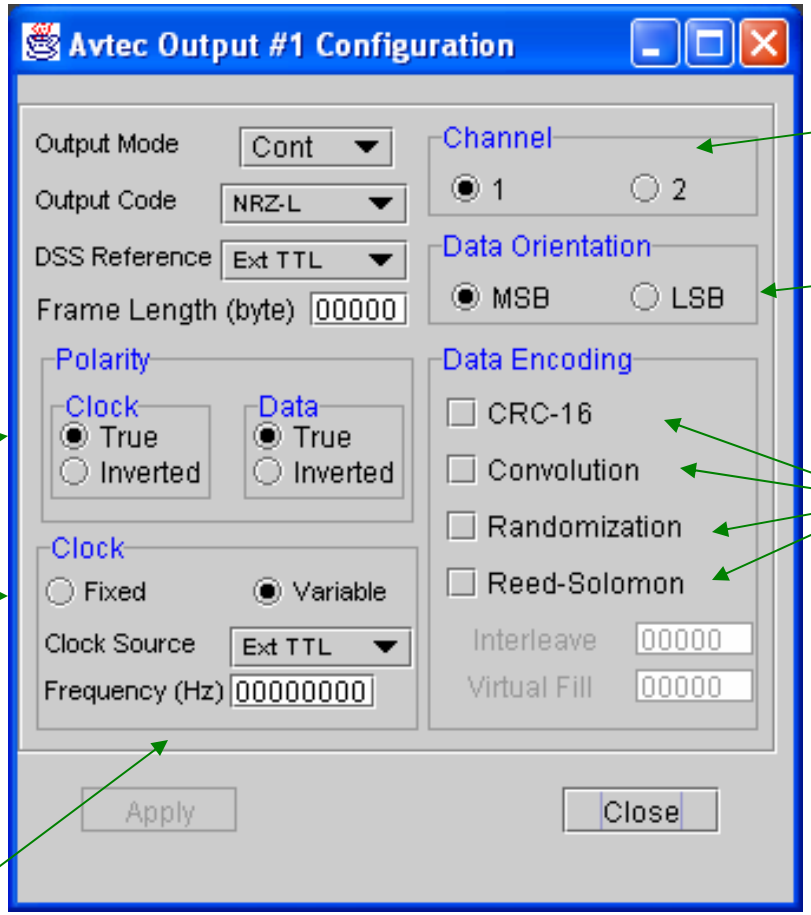
Not Implemented

Selects the Output Polarity of the Clock and Data

Use Fixed Clock Variable Clock not fully implemented

Select Internal, External 422 or External TTL Clock

Internal Clock Rate

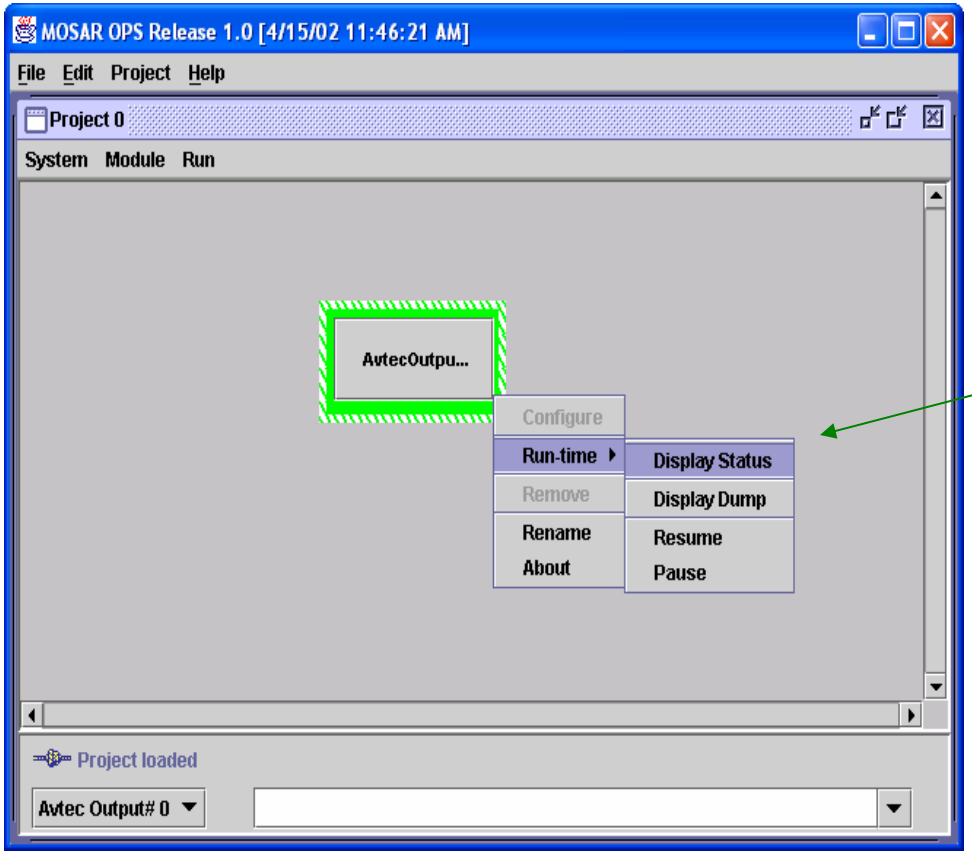


Select which AVTEC Card is to be used

Allows for transmission in LSB Mode. You need to really want to do this

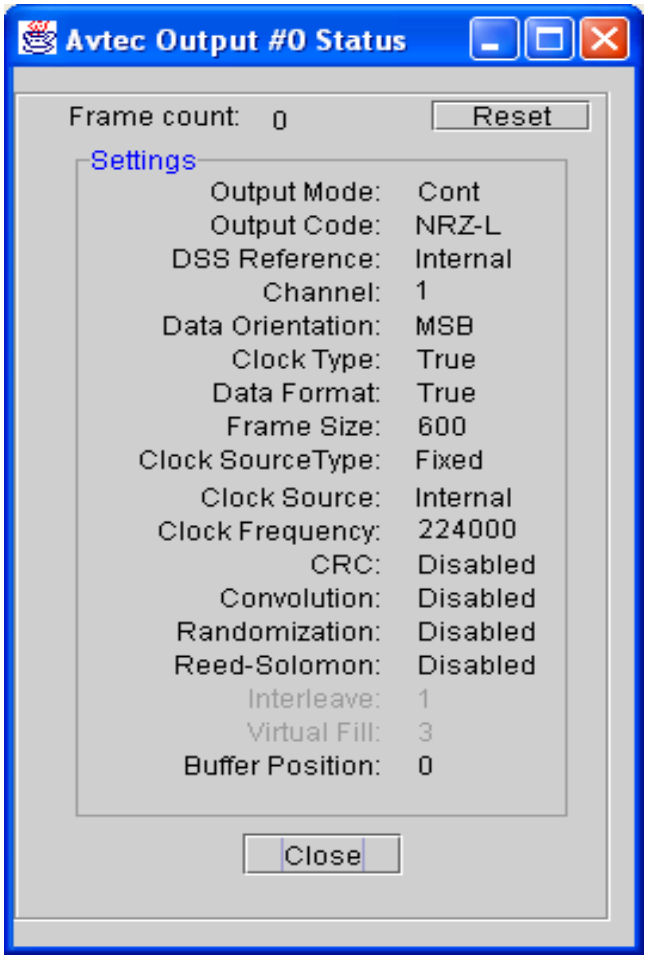
See User's Guide for additional Information on these parameters

AVTEC Serial Output Run Time



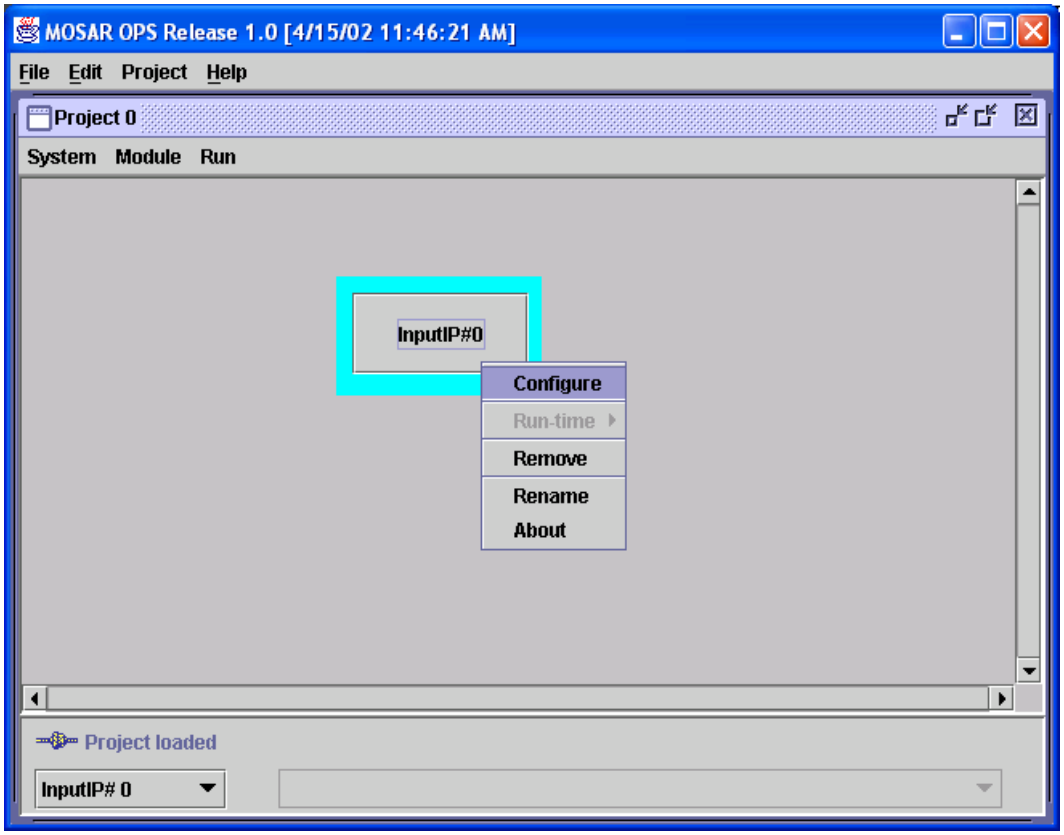
The Run Time Drop Down Windows allow the User to open the Status Window, Display the Raw Data, Stop, or restart the module

AVTEC Serial Output Status Display



This display mainly shows the output configuration. The Frame count indicates the number of buffers that have been transmitted.

Input IP Module



The Input IP Module has no Input Channels and 1 Output Channel

It is a Non-Run Time Configurable Module

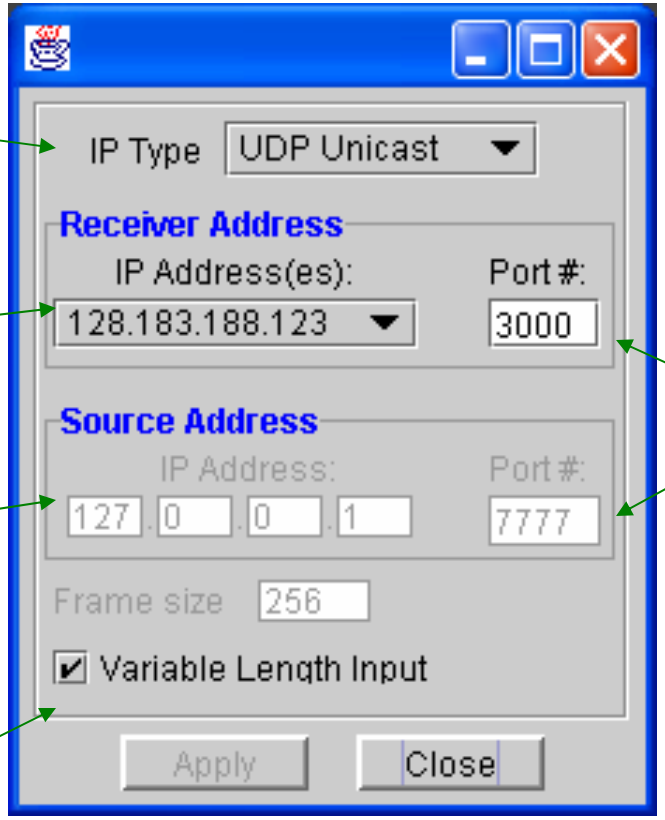
Input IP Configuration

Allows the user to select UPD Unicast, Mulitcast, TCP Client , and TCP Server

This allows the user to select different Cards if the system has more that one NIC

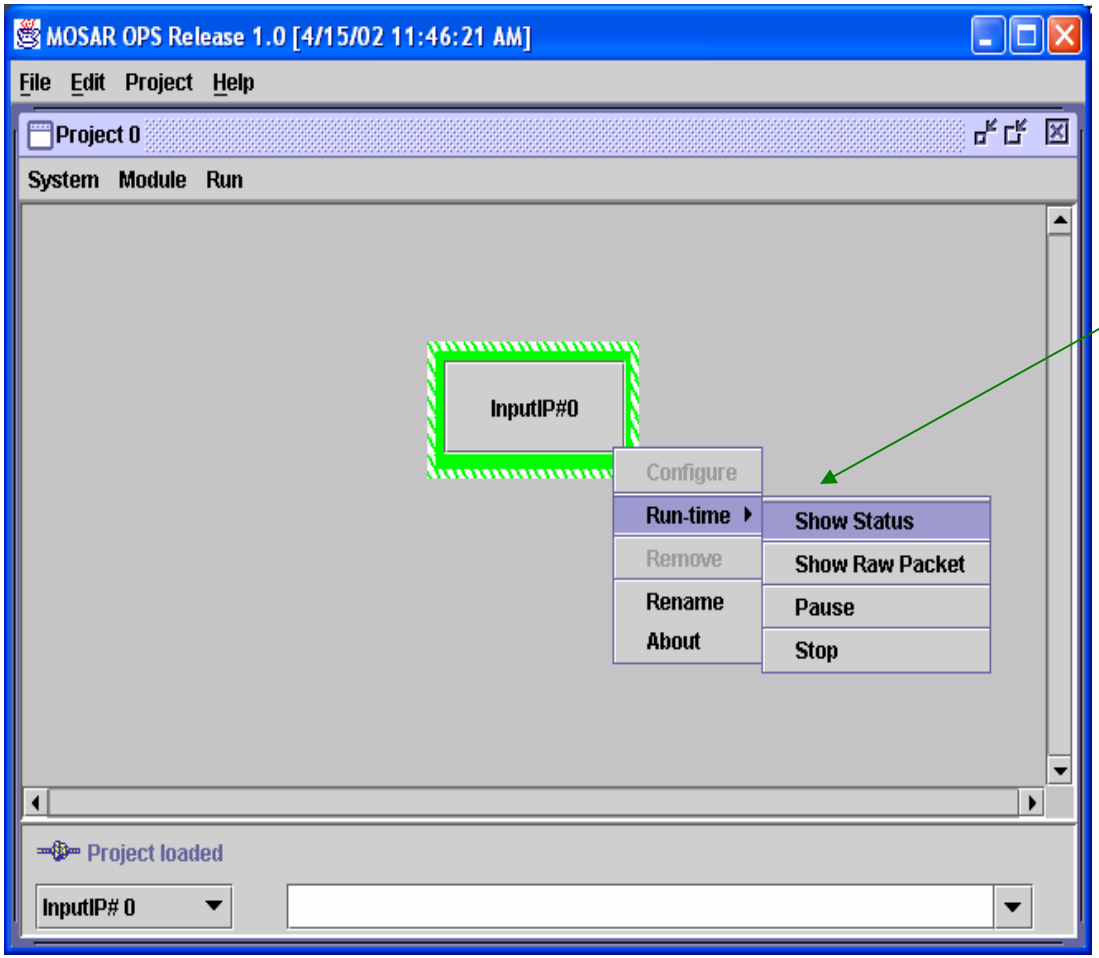
Address of the machine that is sending the data. This is also where the Multicast Group Address is entered

Selects between Fixed and Variable Length Packets. Usually this will be in Variable



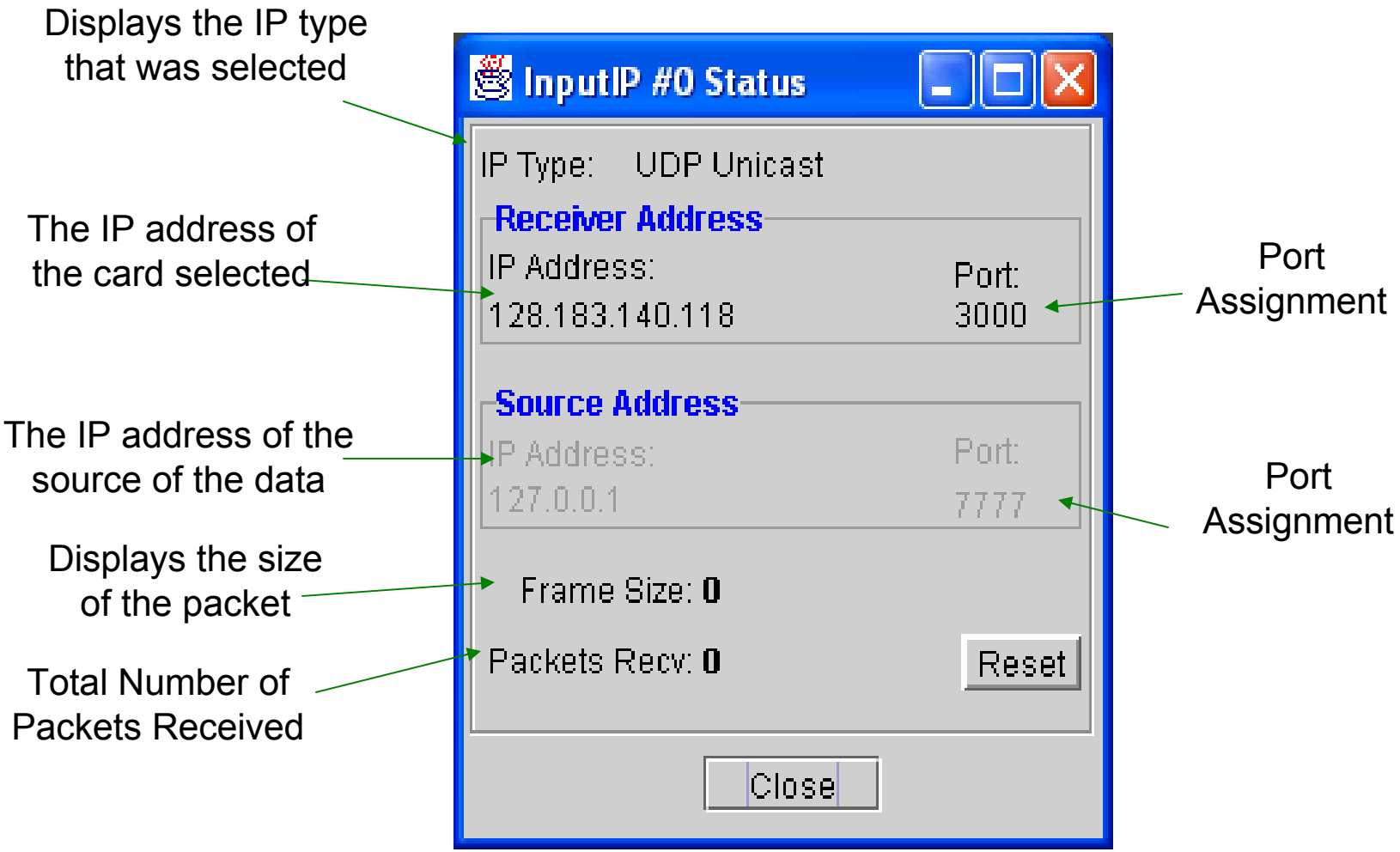
Select the Port #

Input IP Run Time

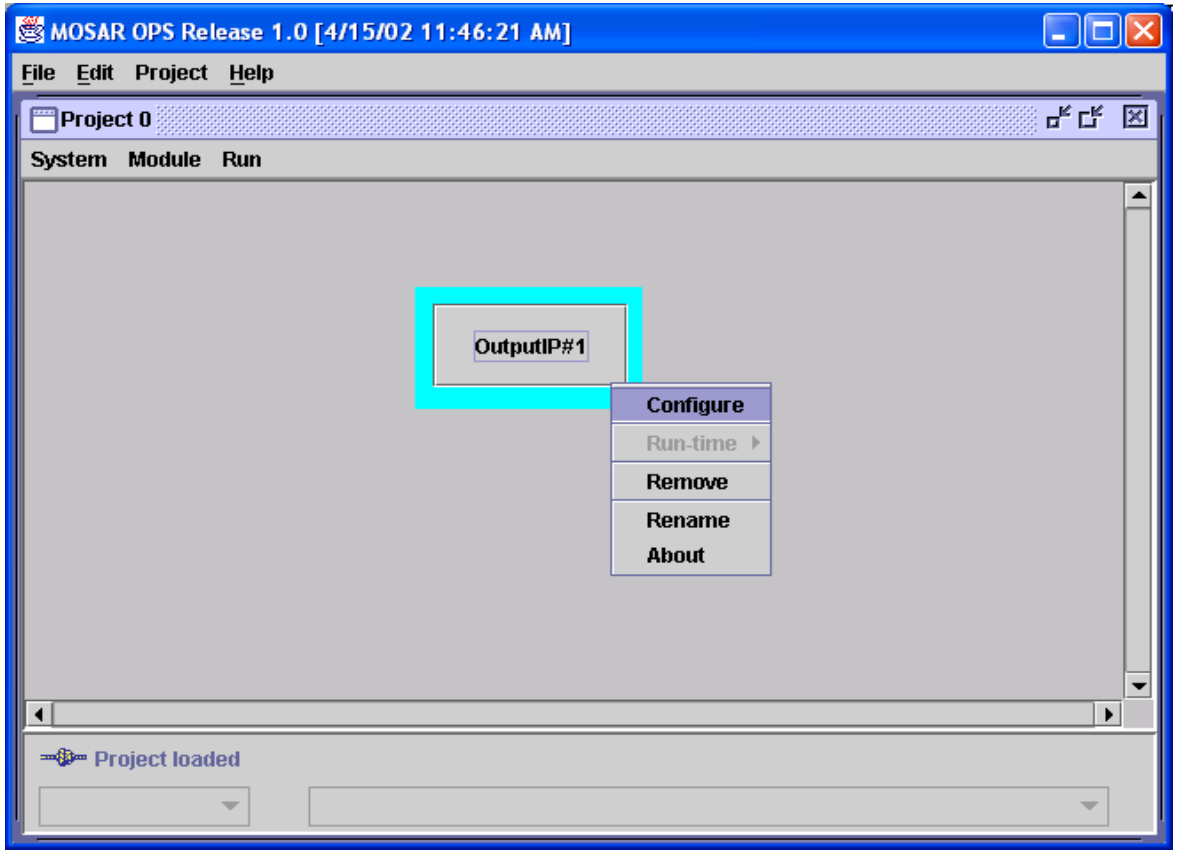


The Run Time Drop Down Windows allow the User to open the Status Window, Display the Raw Data, Stop, or restart the module

Input IP Status Display



Output IP Module



The Output IP Module has 1 Input Channel and no Output Channels

It is a Non-Run Time Configurable Module

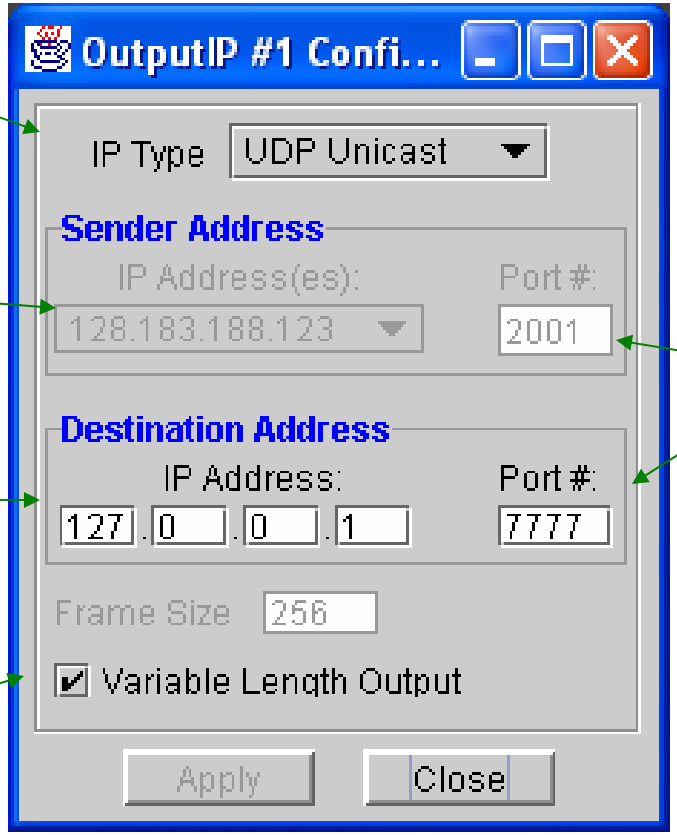
Output IP Configuration

Allows the user to select UPD Unicast, Mulitcast, TCP Client , and TCP Server

This allows the user to select different Cards if the system has more that one NIC

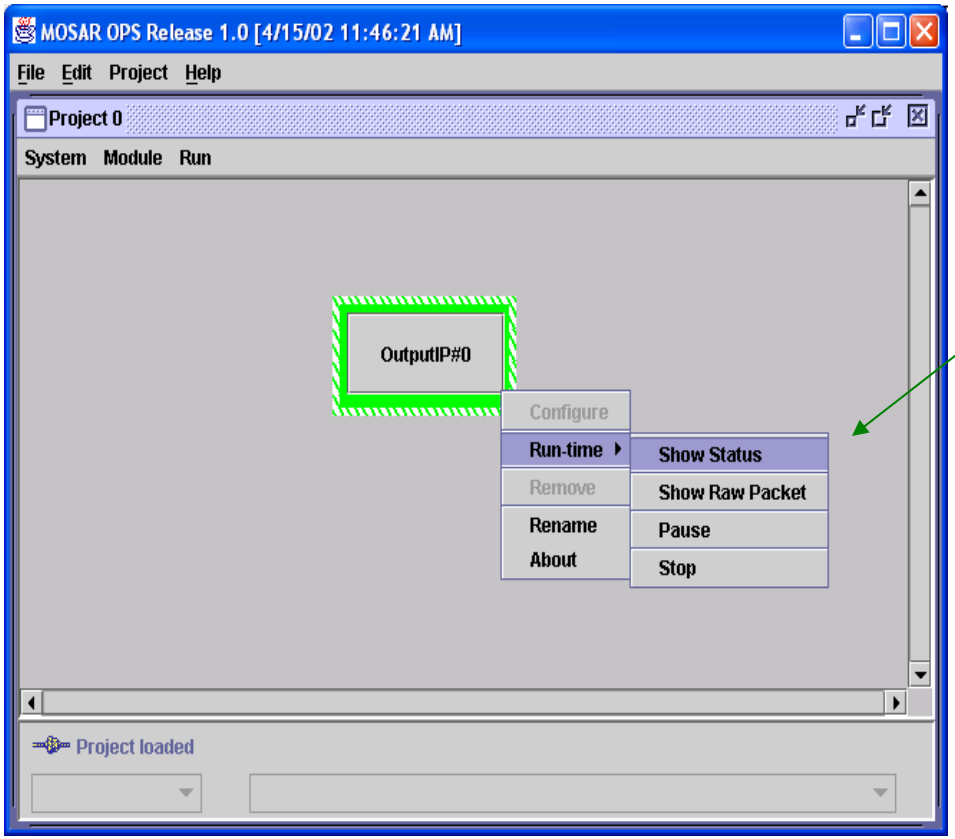
Allows the User to specify the address to of the machine to send the data to and also specify the Multicast Address

Selects between Fixed and Variable Length Packets. Usually this will be in Variable



Select the Port #

Output IP Run Time



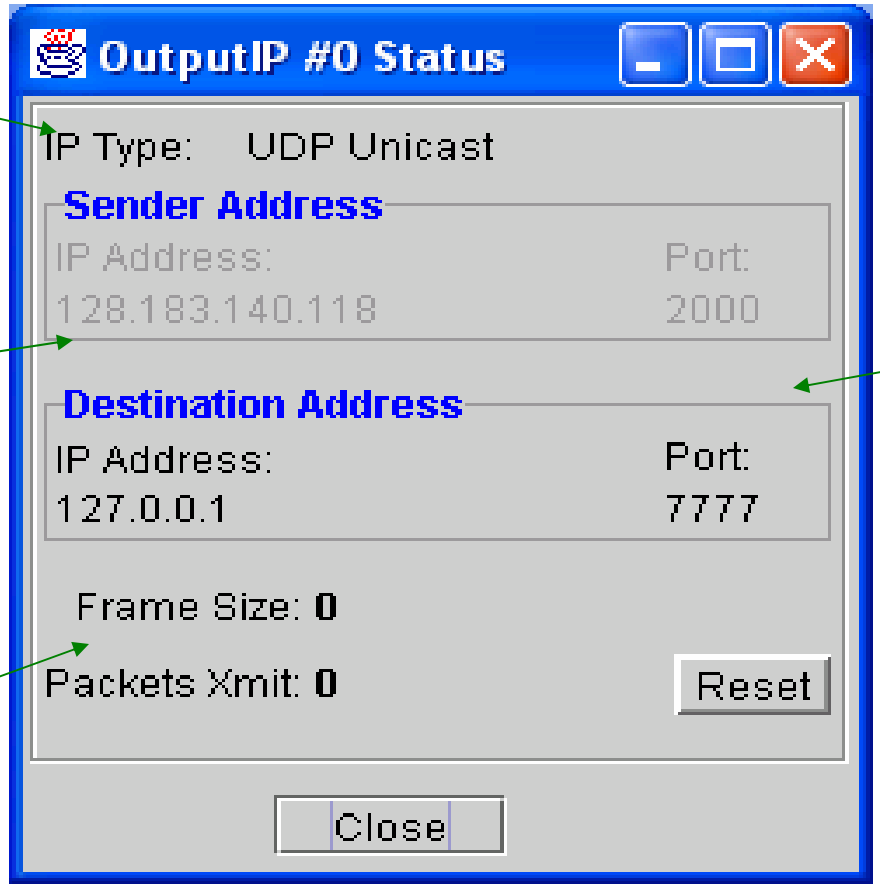
Use the drop down window to open the status display, raw data display, start, or stop the module

Output IP Status Module

Displays the packet type selected

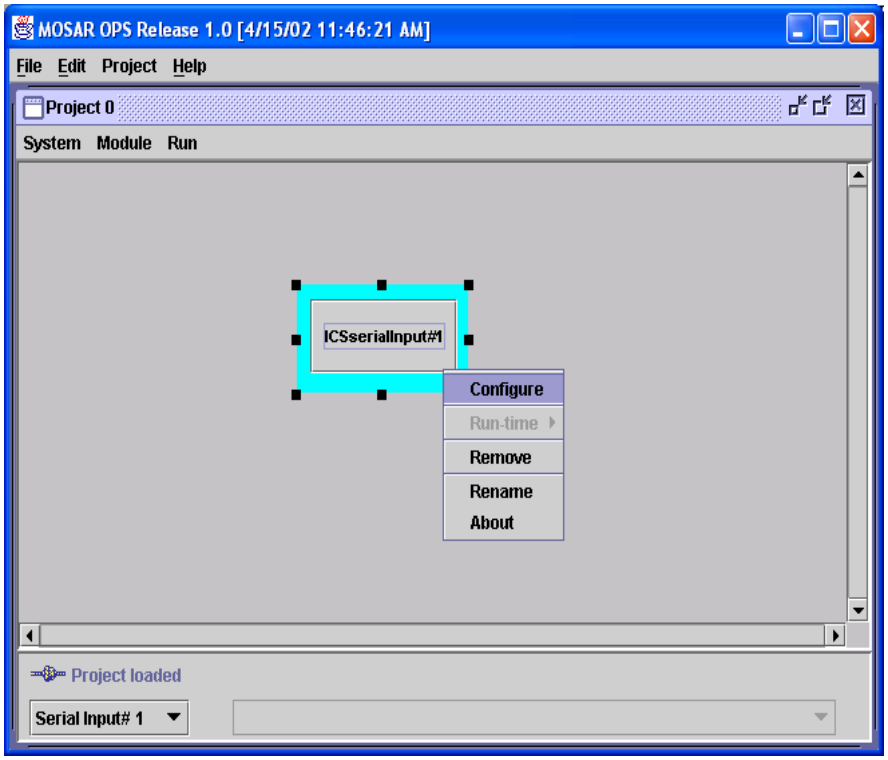
Displays the IP address selected

Displays the size of the last packet received and the # of packets received



Displays the Port selected

Serial Input Module



Serial Input Module has no Input Channels and 1 Output Channel

It is a Non-Run Time Configurable Module

Serial Input Module Configuration

Select between NRZ-L, M, or S

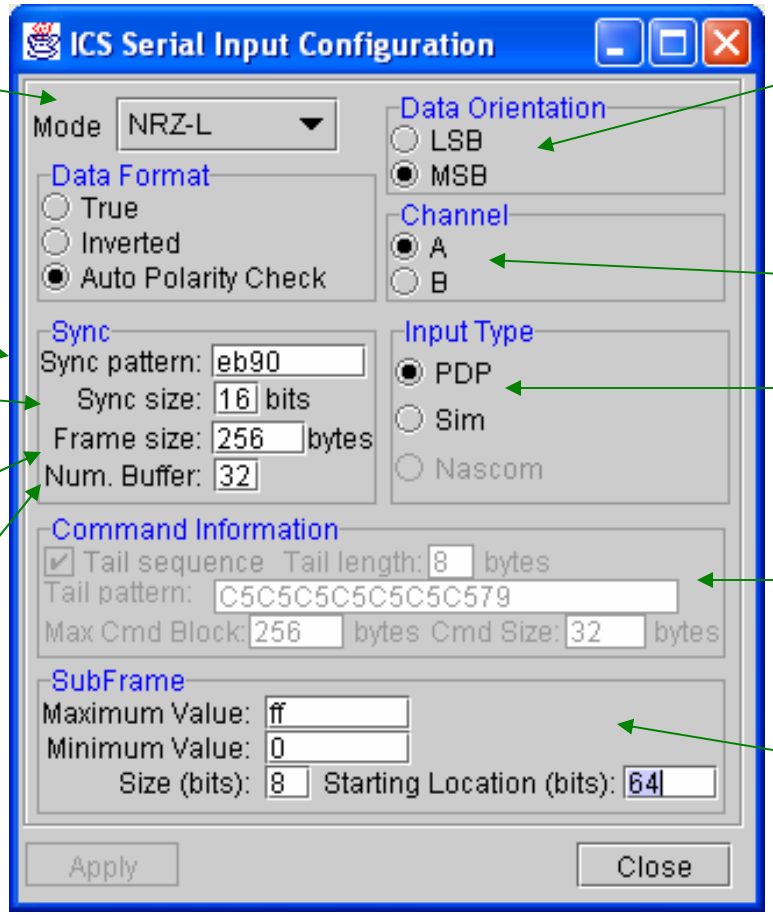
Select the Polarity of the Data or APC Mode

Enter the Sync in Hex

Enter the Sync Length in Bits (The module will support 32 bits but 16 is the recommended maximum

Enter the Frame Length 4096 is maximum

Number of Software buffers to use.



Input data in either LSB or MSB mode

Select which Card to use

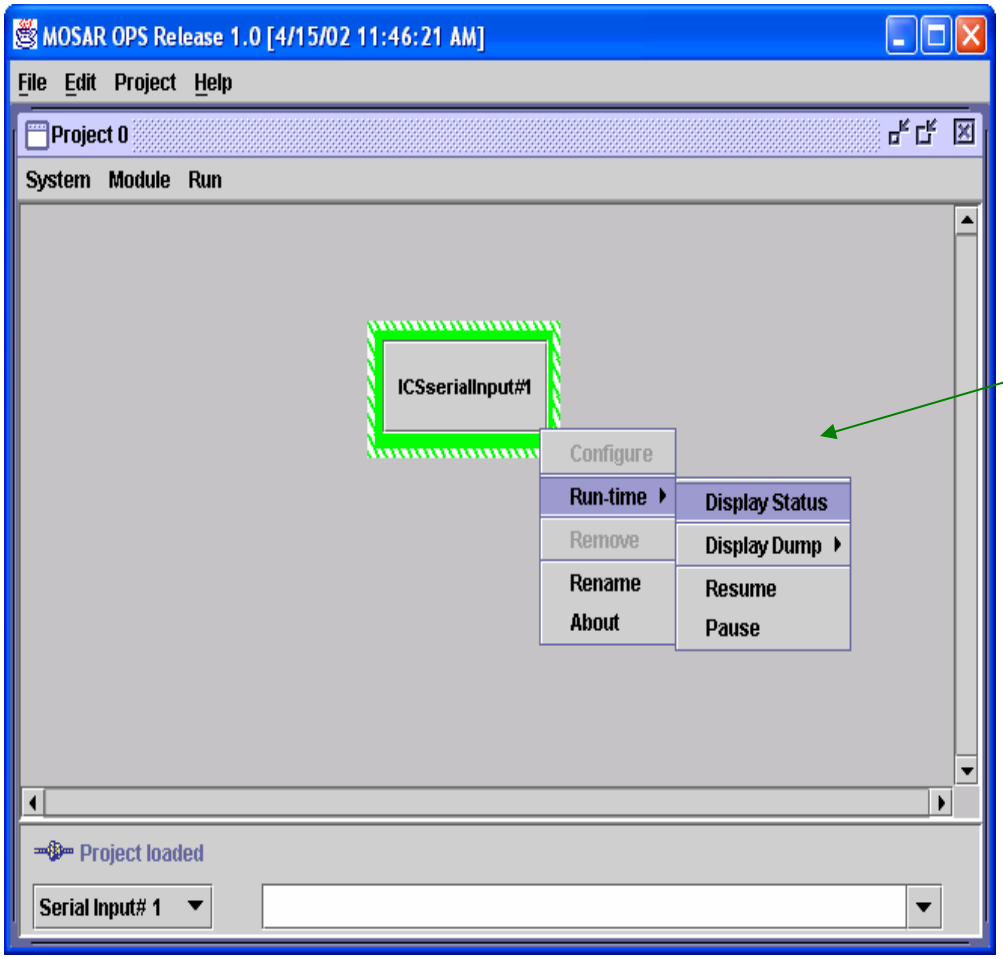
PDP is typically used for TLM and SIM for Commands

Setup for Tail Sequence /Postamble Allows for Cmd Size

Allows the user to setup for subframe detection.

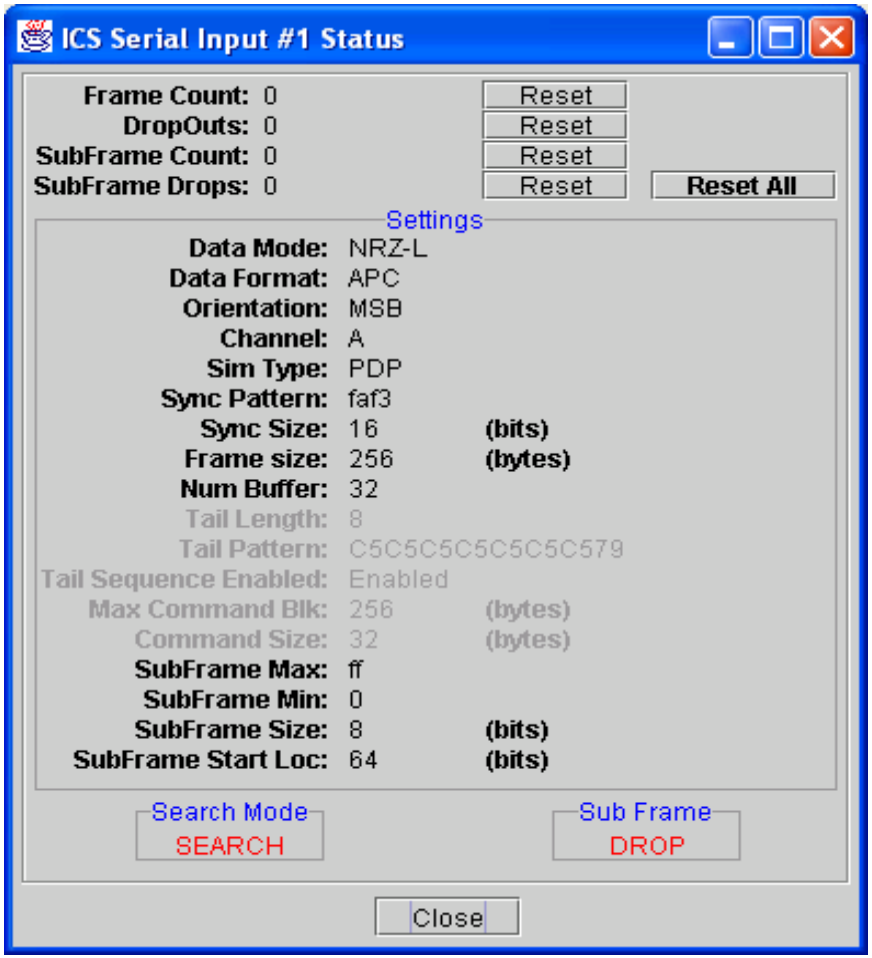
Frame Monitor does a better job of this

Serial Input Run Time



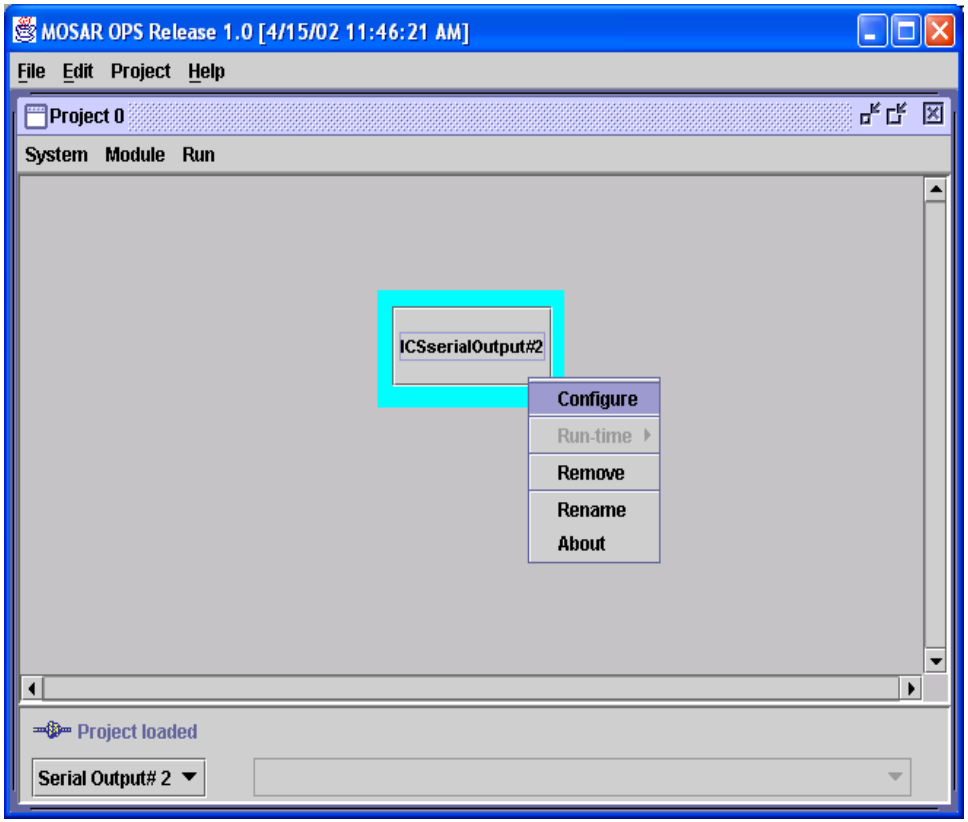
The Run Time Drop Down Windows allow the User to open the Status Window, Display the Raw Data, Stop, or restart the module

Serial Input Status



This display mainly shows the output configuration. The Frame count indicates the number of buffers that have been transmitted.

Serial Output Module



Serial Output Module has 1 Input Channel and no Output Channels

It is a Non-Run Time Configurable Module

Serial Output Module Configuration

Selects NRZ-L,M,S or BIØ- L,M,S for Output

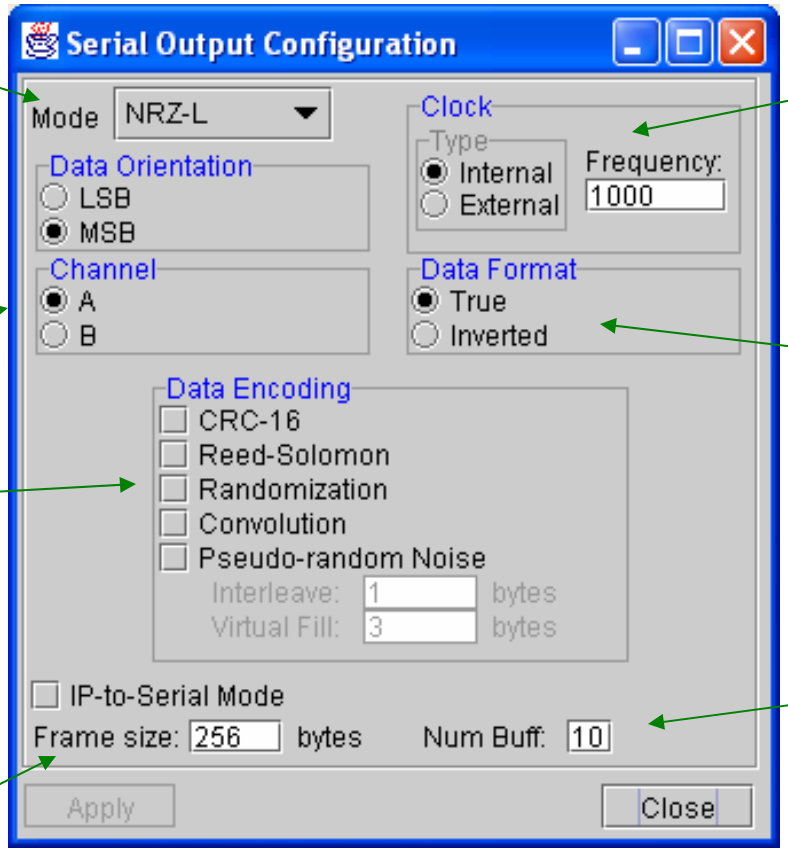
Transmit data in MSB or LSB mode

Select the output card to use

See User's Guide for additional Information on these Items

Allows for some buffering of data

Must be set to the size of the packet transmitted from the previous module

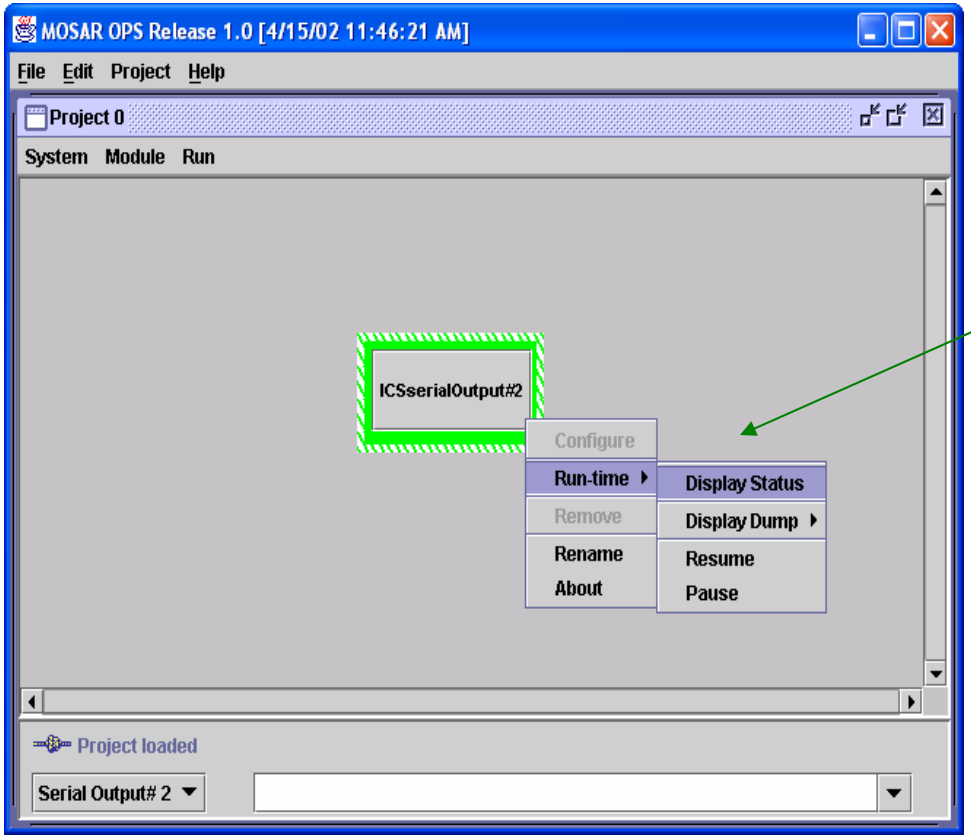


Select Internal or External Clock source and set the Closk Rate when in Internal. Not all Clock rates are supported.

Select True or Inverted Data

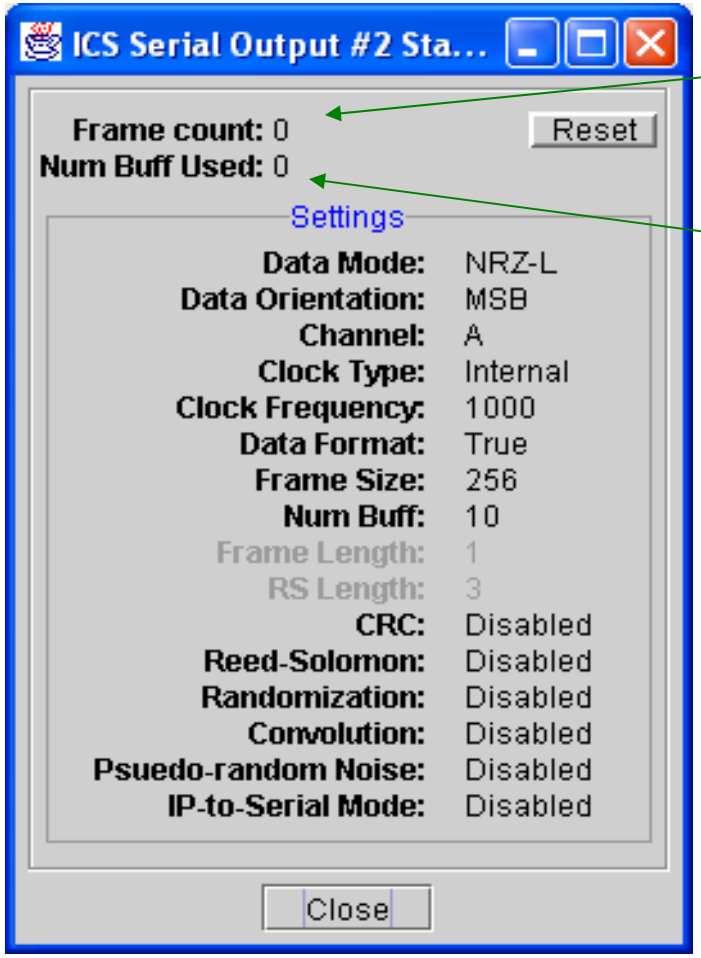
Number of software buffers to use.

Serial Output Run Time



The Run Time Drop Down Windows allow the User to open the Status Window, Display the Raw Data, Stop, or restart the module

Serial Output Status



The Frame count indicates the number of buffers that have been transmitted.

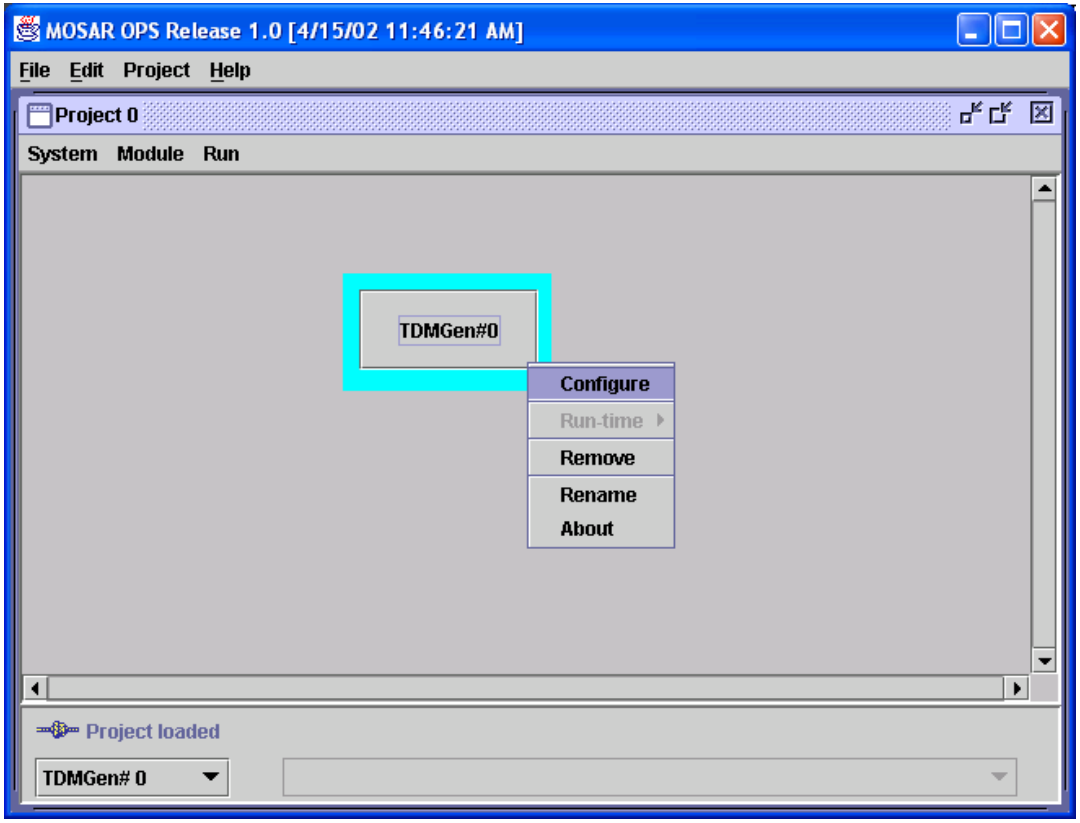
Number of Buffers used indicates how many buffers are in the Queue.

This display mainly shows the output configuration.

Data Generation Modules

- The following modules are used to generate data.
  - TDMGEN
  - TDMCMDGEN
  - GENTLM
  - CMDXMIT
  - JSC Voice Pattern

TDMGEN



TDMGEN has 3 Input Channels and 1 Output Channel

It is a Non-Run Time Configurable Module

TDMGEN

Frame Length Maximum is 4096

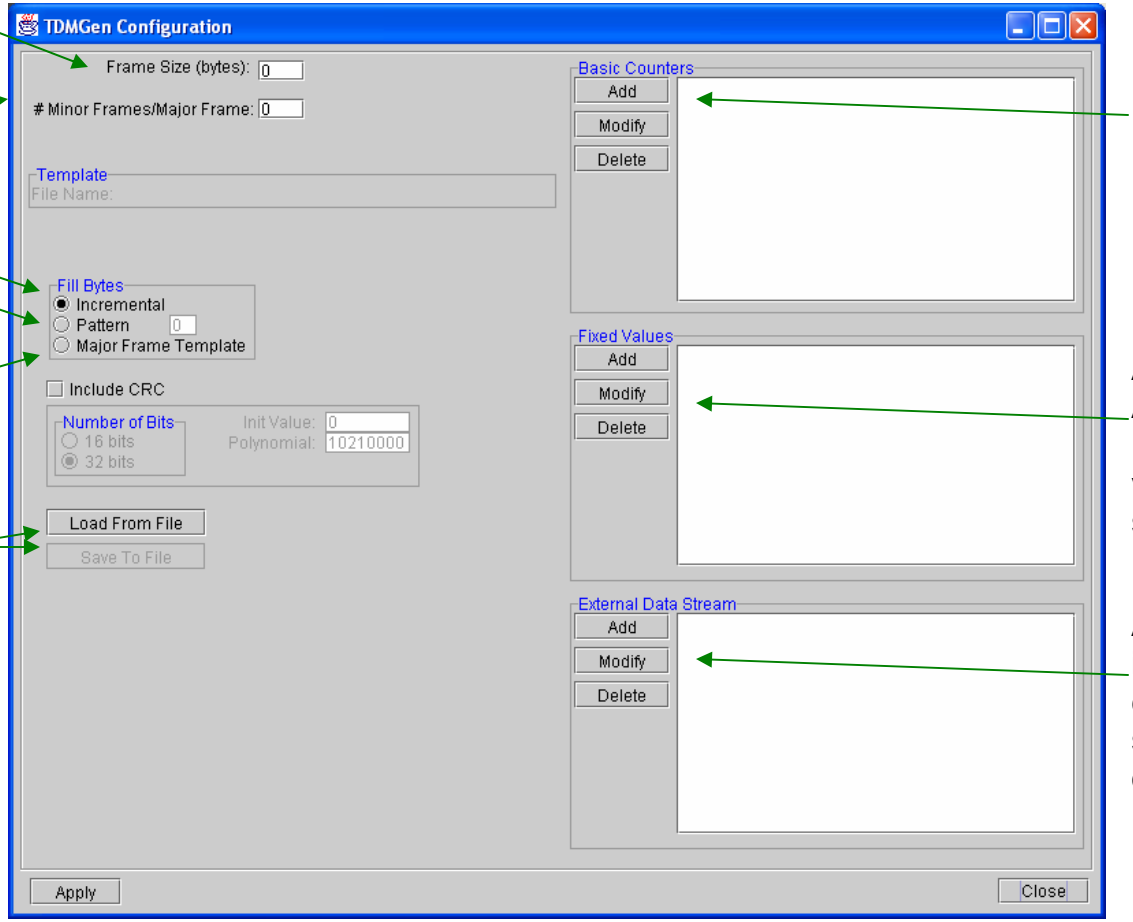
Minor Frames per Major Frame (Decimal Value)

Inserts the Byte Number

Allows the User to enter a pattern

Load a major frame from disk

Load or Save a Configuration File



Allows the User to Add, Modify, or Delete a counter in the data stream

Allows the User to Add, Modify, or Delete a fixed value in the data stream

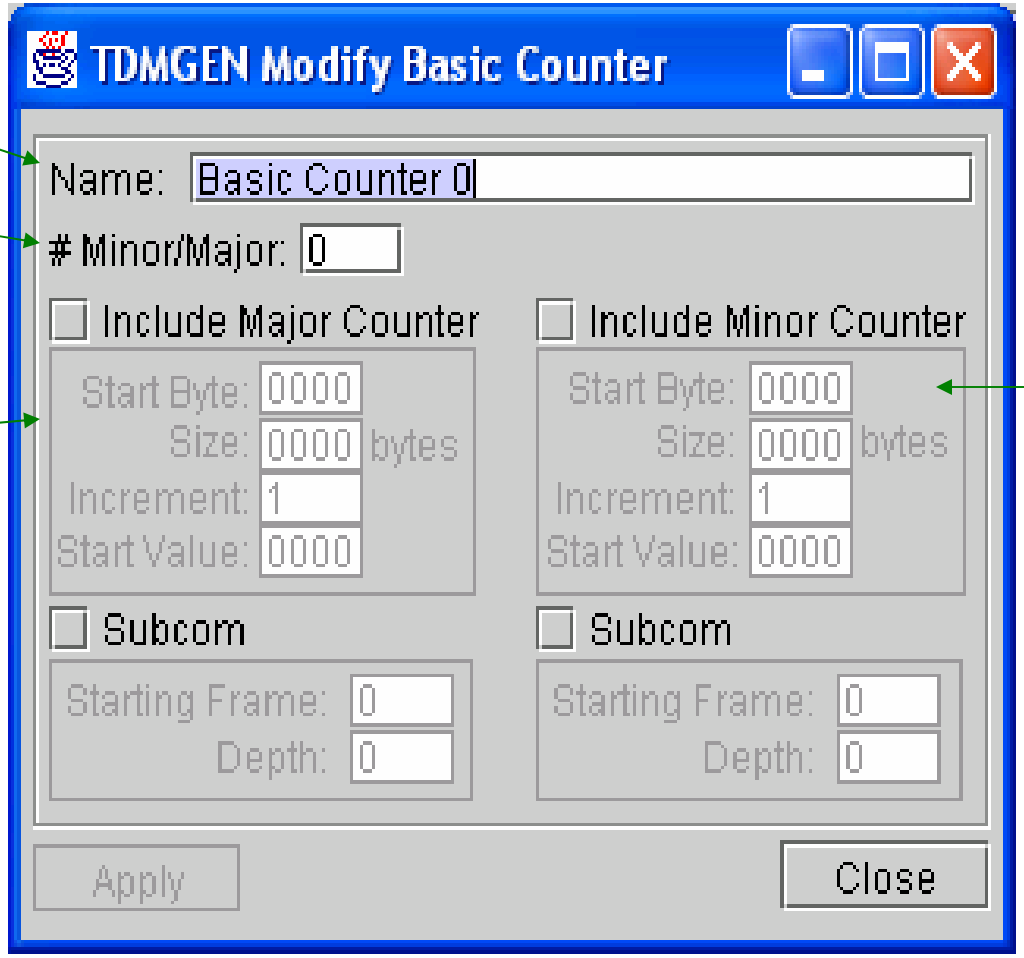
Allows for insertion of an external data stream into the output stream

TDMGEN Basic Counter Window

Provide a Name to the Counter

This value is transferred from the main configuration window

Major Frame Counter Setup



Use this to setup minor frame counters. The Frame starts with byte 0, so if you have 24 bits of sync and then the subframe counter the start byte would be 3

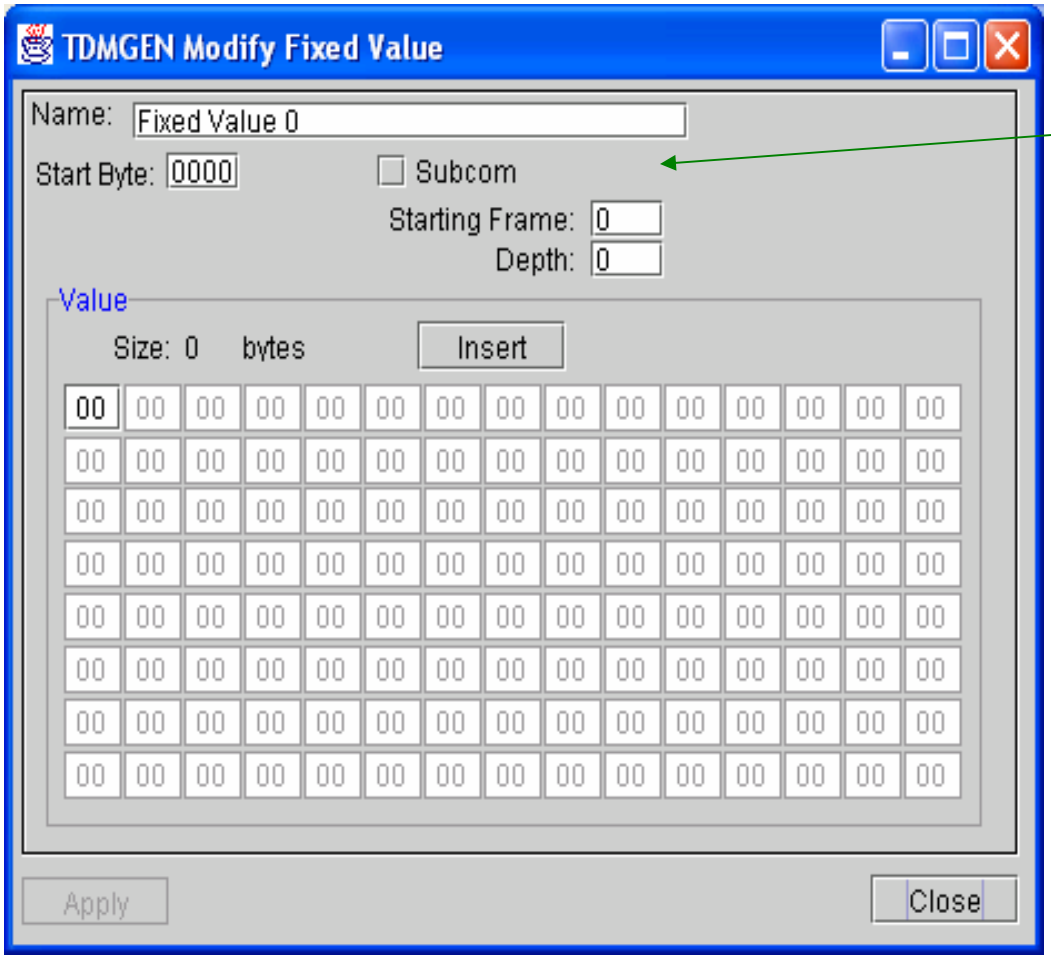
This window appears when the Modify button is selected for the Basic Counter

Modify Fixed Value Window

Provide a name to the value

Start Byte in the Frame

Enter the values in Hex



Use this to insert the data in only certain locations

Starting frame is the first frame the data is to be inserted

Depth determines how many minor frames to insert the data into

External Data Stream Configuration

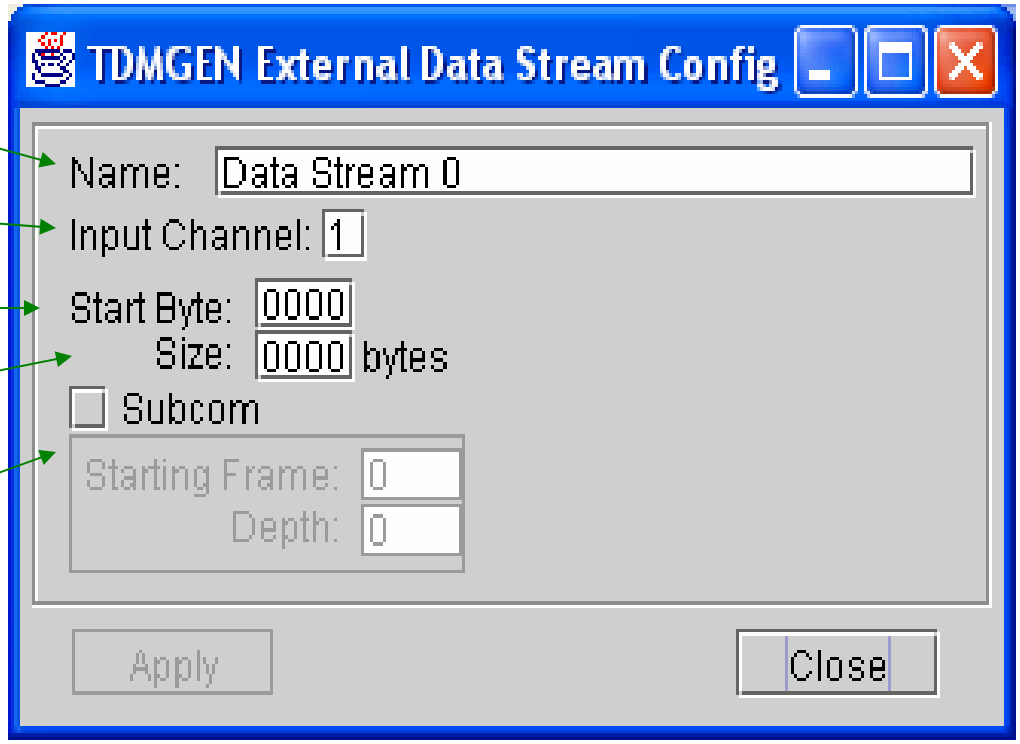
Provide a Name to the Data Stream

Select the Input Channel to use

Where to insert the data

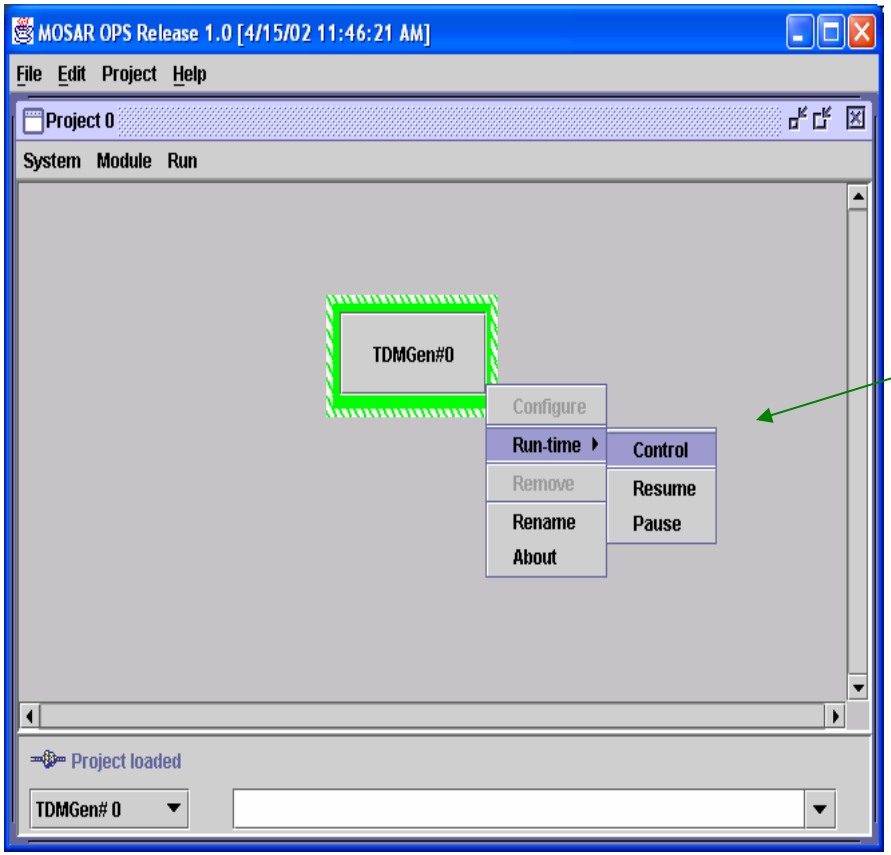
Number of Bytes to Insert

Use to define subcoms to insert data



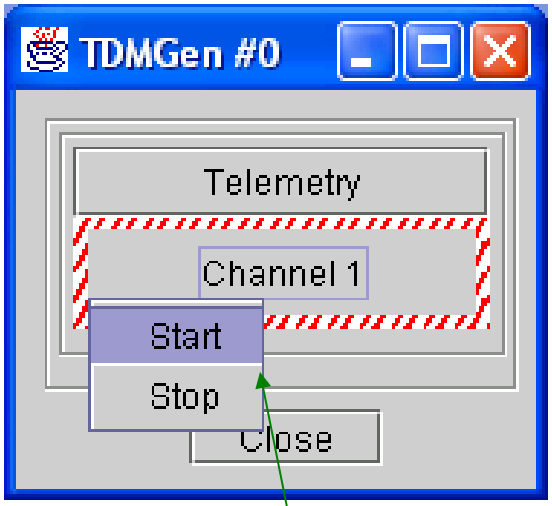
This window appears when the modify External Data Stream is clicked

TDMGEN Run Time

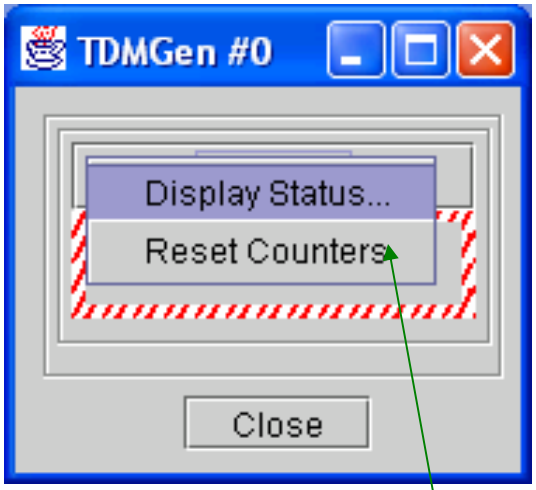


Use this drop down to open the Control Window

TDMGEN Control Window

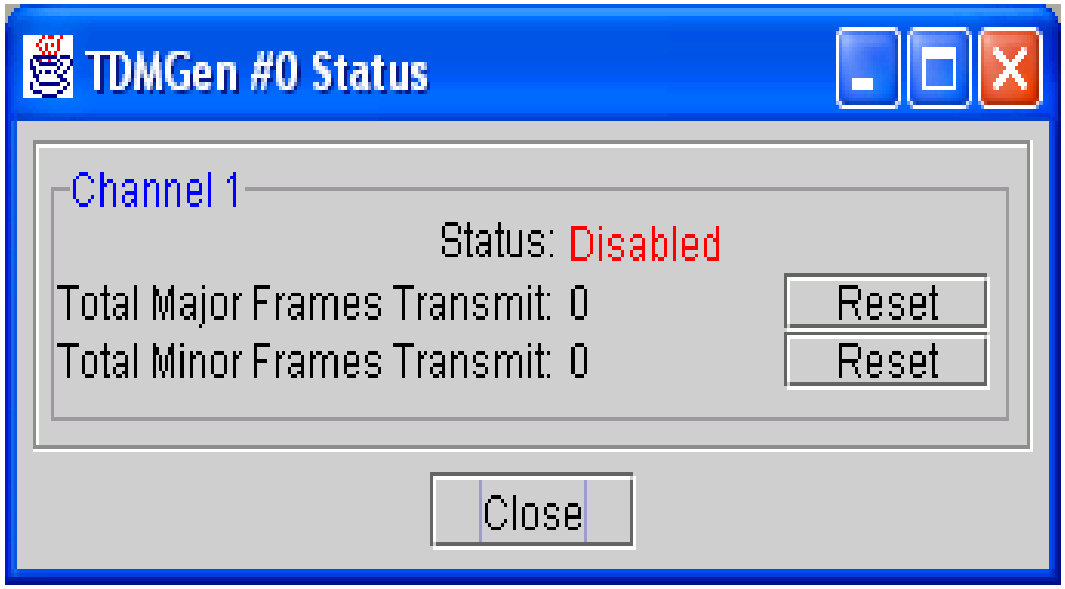


Clicking on the Channel 1 Box will open this drop down. This will allow the user to start or stop the data. When the data is running the outline of the box will turn to green.



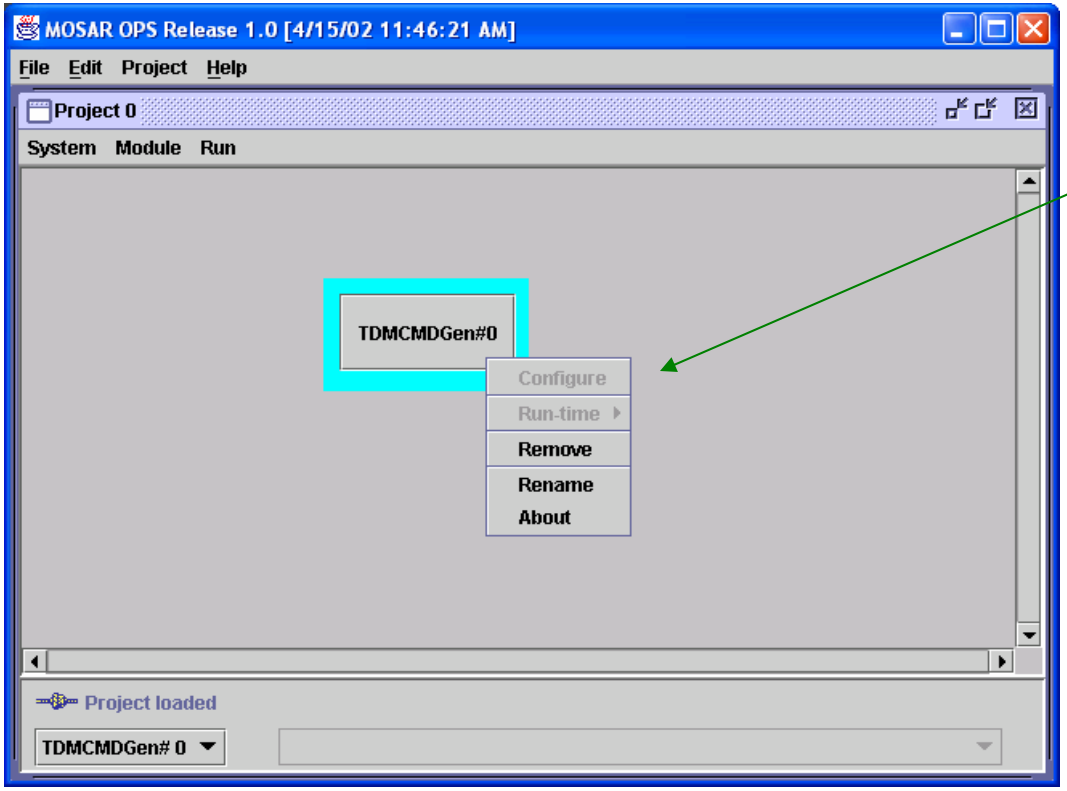
Clicking on Telemetry will allow the user to open the status display or reset the counters

TDMGEN Status Display



This displays allows the user to verify the status of the stream and the number of frames transmitted.

TDMCmdGen

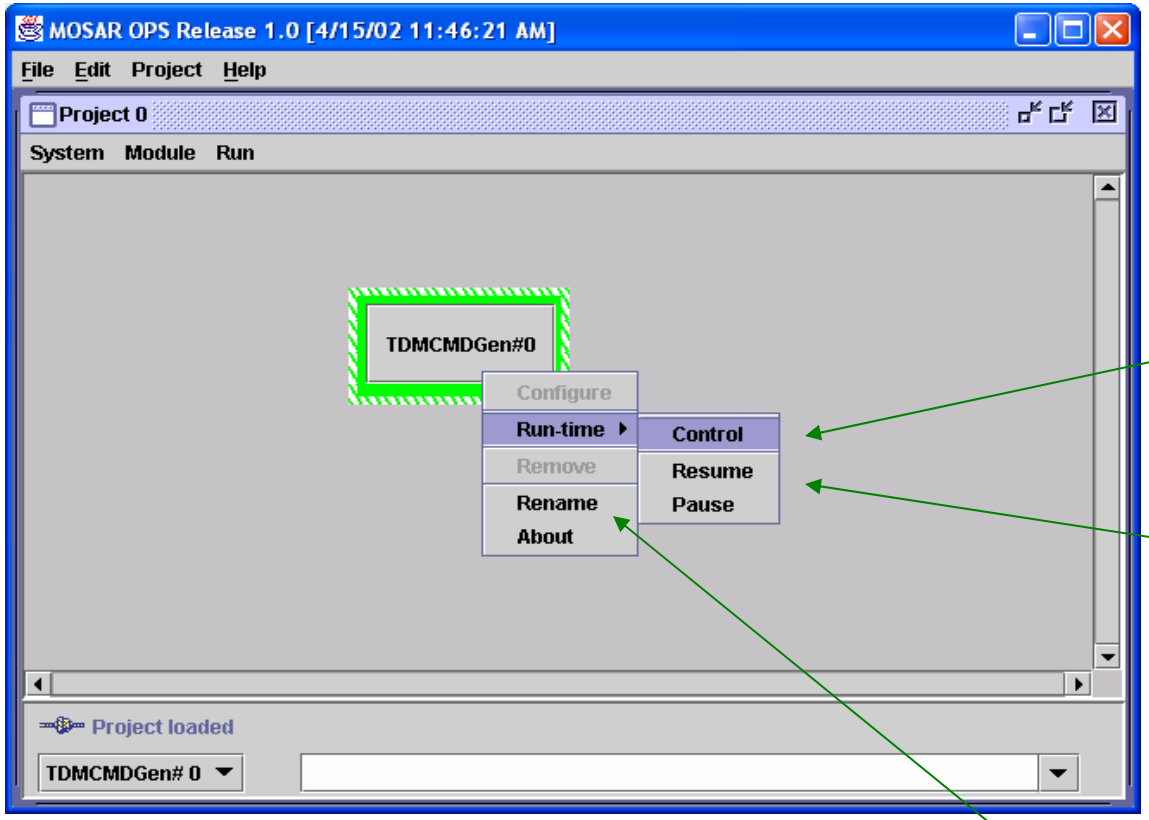


Configure is "Grayed" out. This indicates that this module can not be configured in this mode

TDMCmdGen has no Input Channels and 1 Output Channel

It is a Run Time Configurable Module

TDMCmdGen

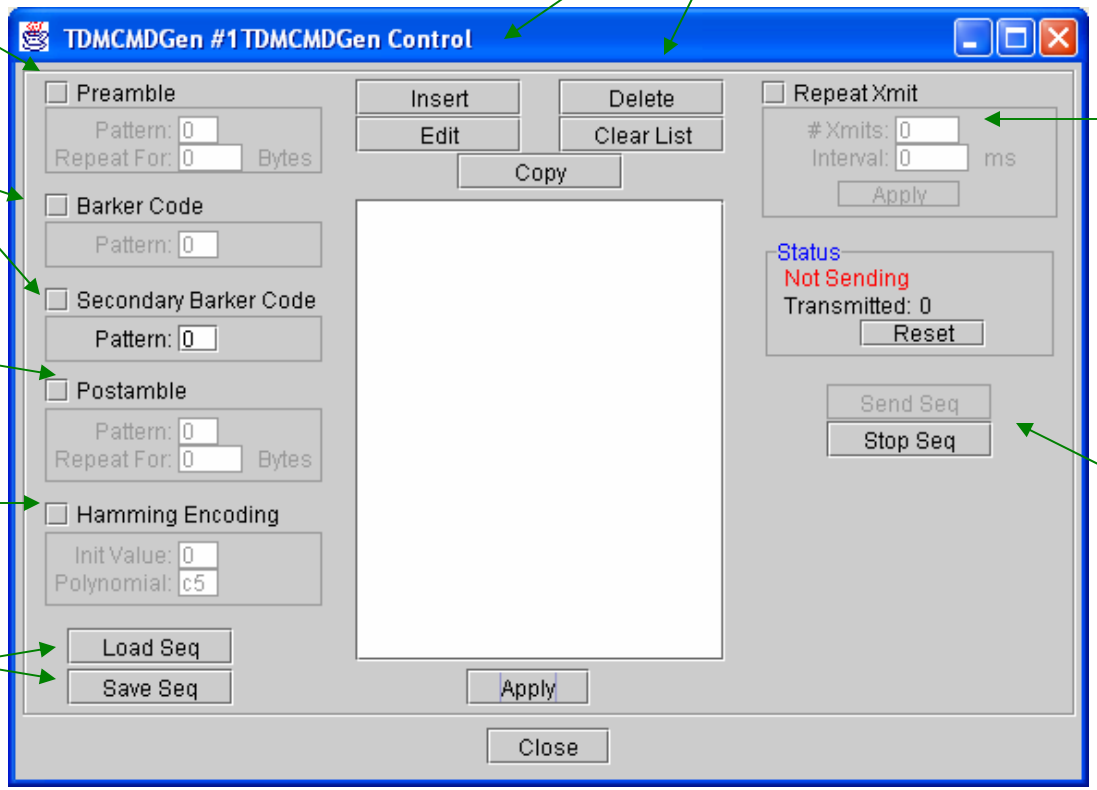


To configure the module to send a command you must select ***Run Time*** and then select ***Control***

Pause and Resume can be selected to stop or start the module

Clicking here allows the user to Specify a new name for the module

TDMCMDGEN



Allows the User to set up commands

Specify Preamble Length and Pattern

Specify Barker or S/C Sync

Specify Postamble Length and Pattern

Perform the Encoding

Allows the user to Load or Save Configurations

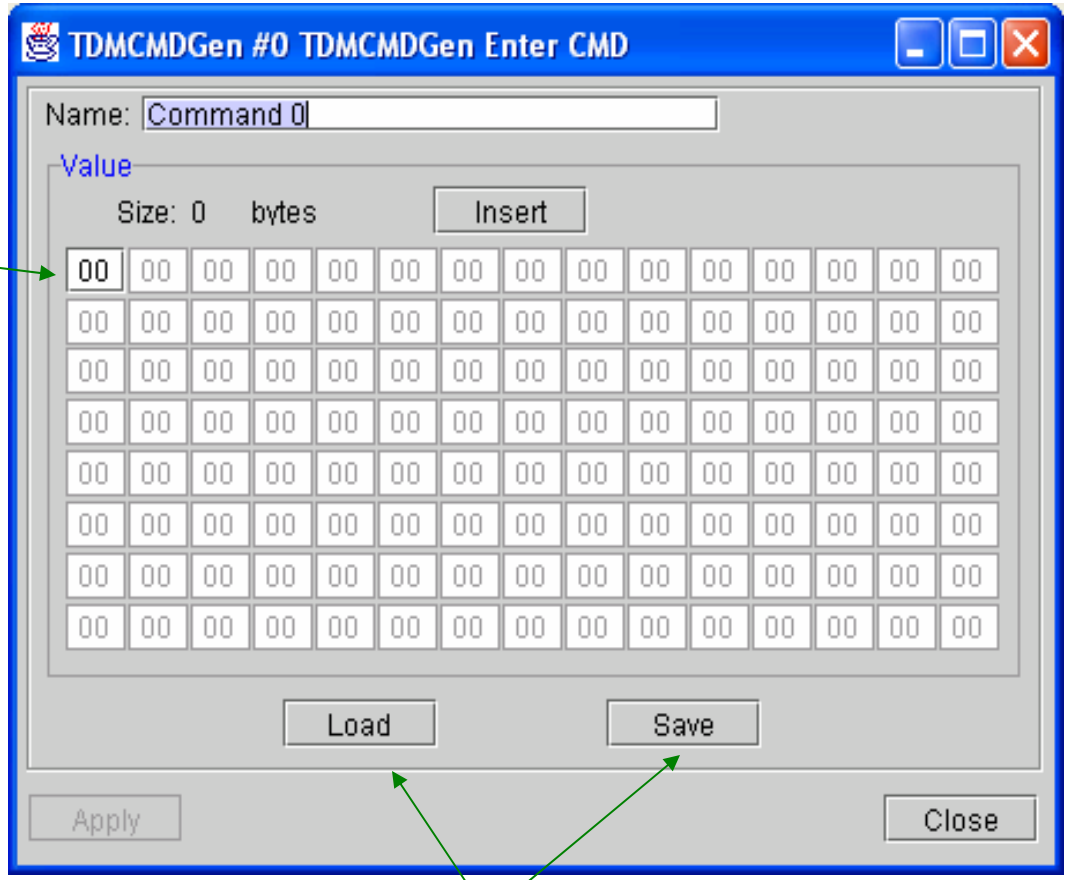
Allows the user to transmit the command a specified number of times and at a specified interval. If # Xmits = 0 it will send until stopped

Used to send the sequence or to stop the sequence

Editing a Command

Provide a name to the command

Insert the command in Hex



This window appears when the Edit button is clicked

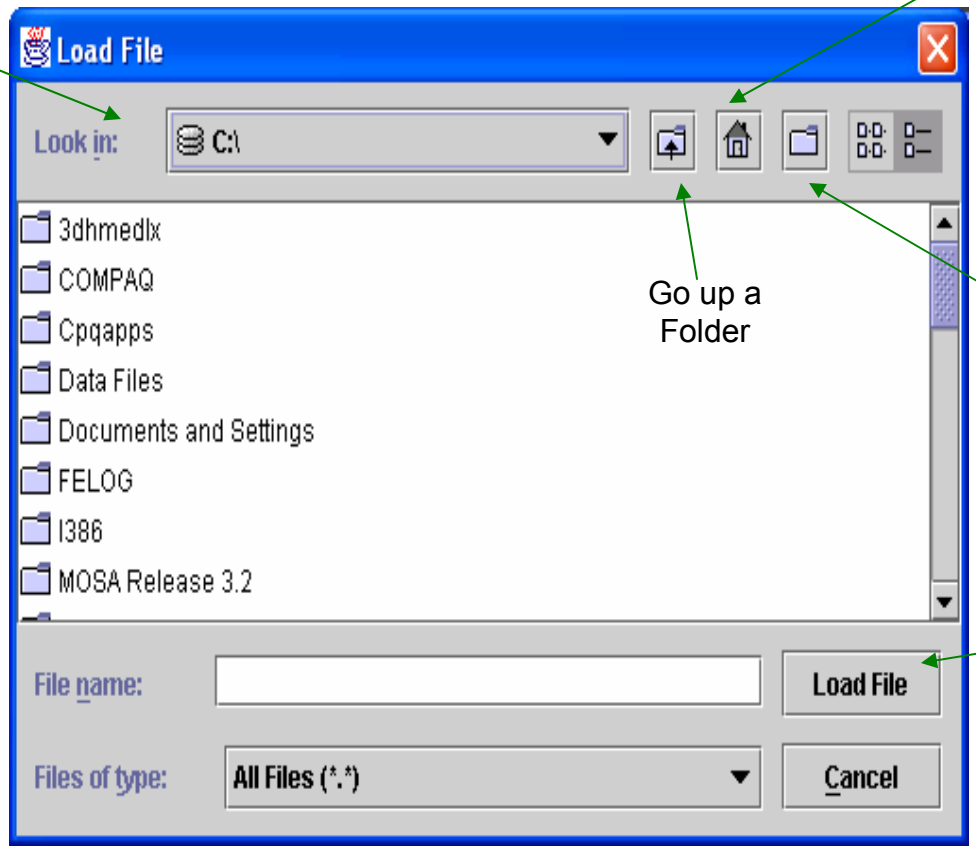
Use these buttons to save or restore a command

TDMCmdGen Load /Save

This is the generic JAVA file browser. This is used by several modules. The Save window functions the same.

Drive being accessed

Go to “Home “ Folder



Available Folders

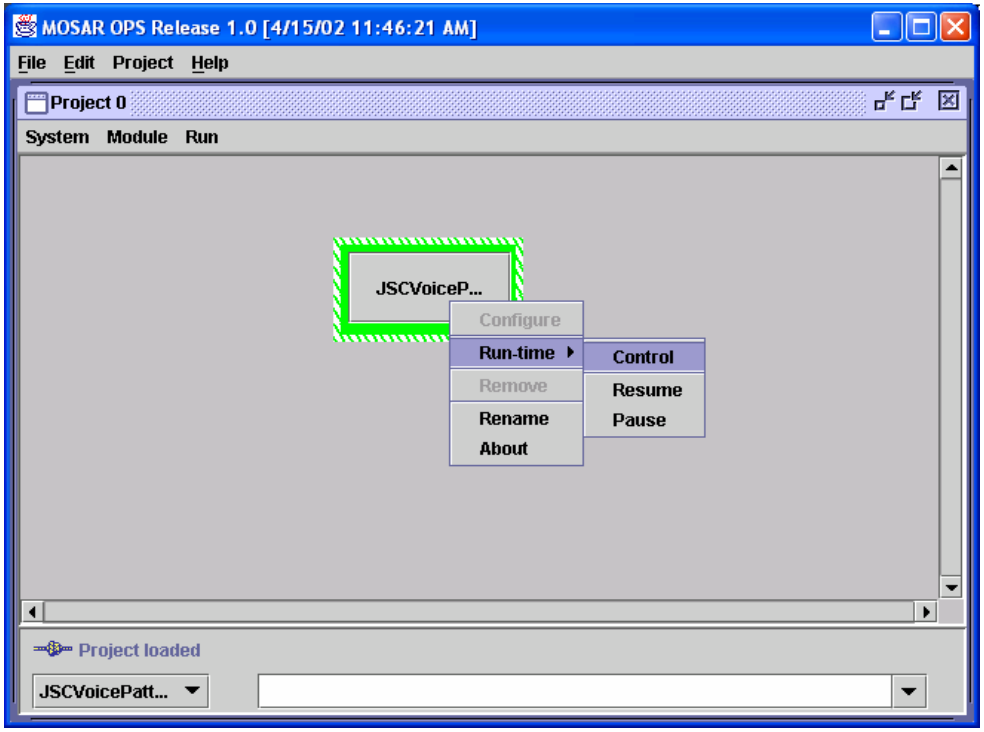
Clicking on the folder will change the view to that folder

Go up a Folder

Create a new Folder

Click here to load the file after the selection has been made

JSC Voice Pattern



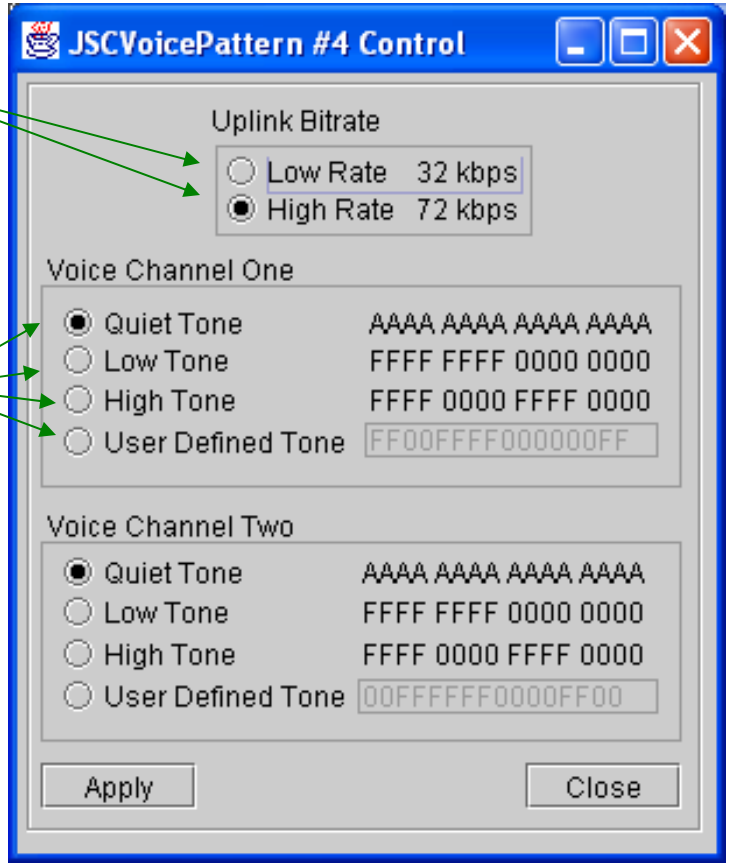
JSC Voice Pattern Module has no Input Channels and 1 Output Channel

It is a Run Time configurable module.

JSC Voice Pattern

Select either the High or Low rate

Select the pattern to insert in the voice words

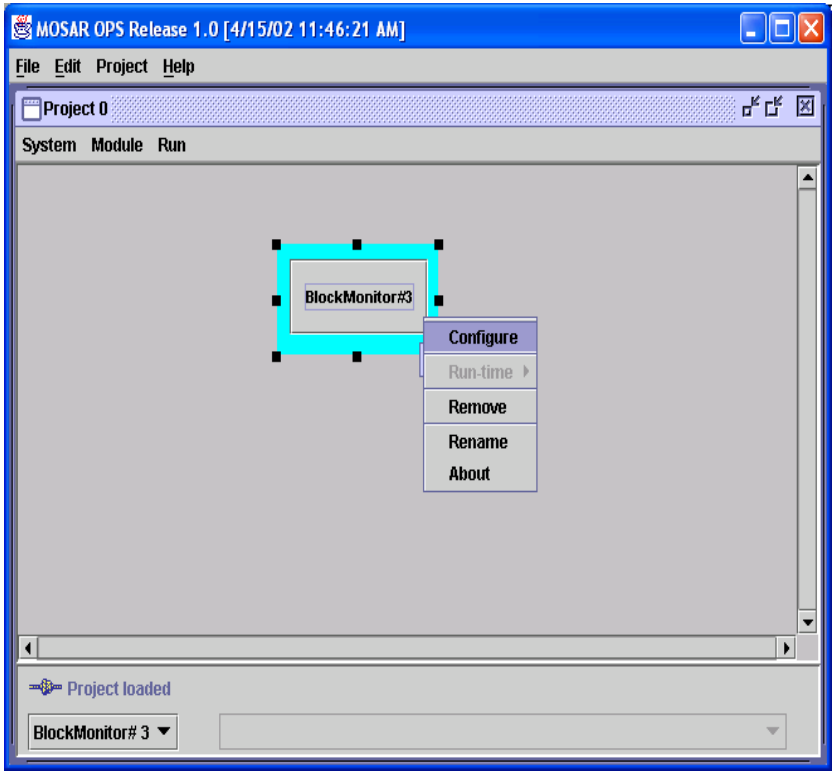


Data Evaluation Class
(Note: some of these modules may also fall into other classes)

- Block Monitor
- Frame Monitor
- Frame Monitor Shuttle
- Generic Command Ingest
- Generic Command Validation
- NASCOM Monitor
- Monitor
- Packet Processor

- Shuttle Command Echo
- Site Status
- TDRSS Checksum
- Track Monitor
- TDM Cmd Ingest
- TDM DQM
- VC Processor

Block Monitor



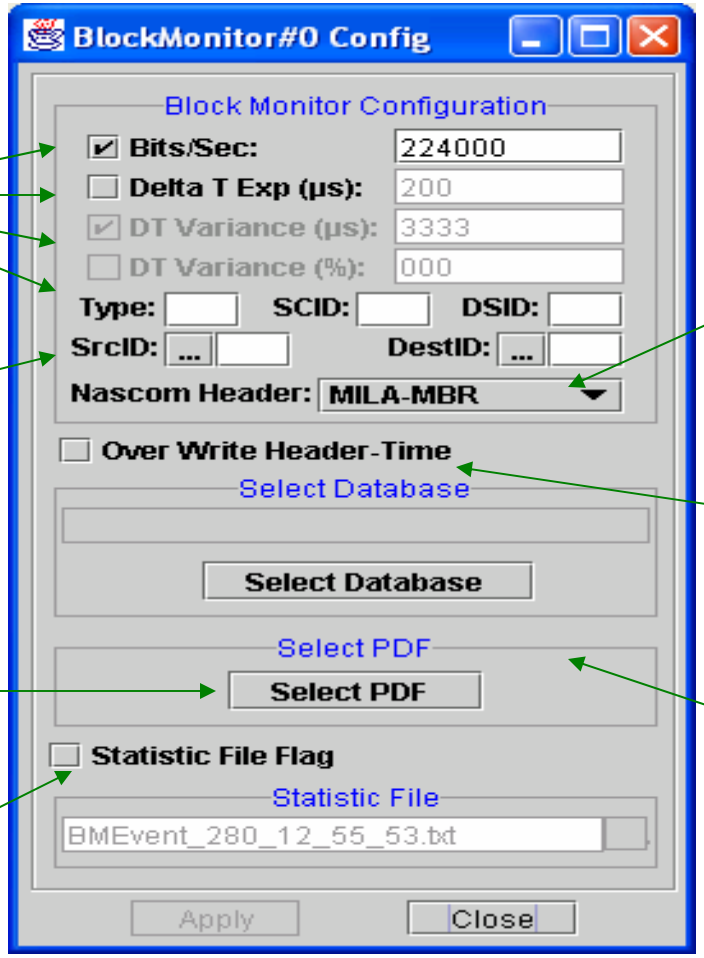
Block Monitor has 1 Input Channel and 3 Output Channels

It is a Run Time Configurable module but it can also be configured while the module is stopped.

Block Monitor Output Channels

- Channel 1
  - The Data Field is extracted from the block and sent out of Channel 1. This essentially makes this a De-Blocked Output.
- Channel 2
  - 4800 NASCOM Block data. The Block monitor can filter on several header items
- Channel 3
  - This channel outputs the contents of the data field but the Block Time, Source, and Destination are added to the beginning of the output packet. This information is used by Frame Monitor and Frame Monitor Shuttle.
- The selection of channels is made when the link is made from the Block Monitor to the next module.

Block Monitor Configuration



Used to calculate the Block Delta Time

Allows the user to specify items to use to filter blocks. You can use 1 or any combination of the items

Select stored configurations from the database

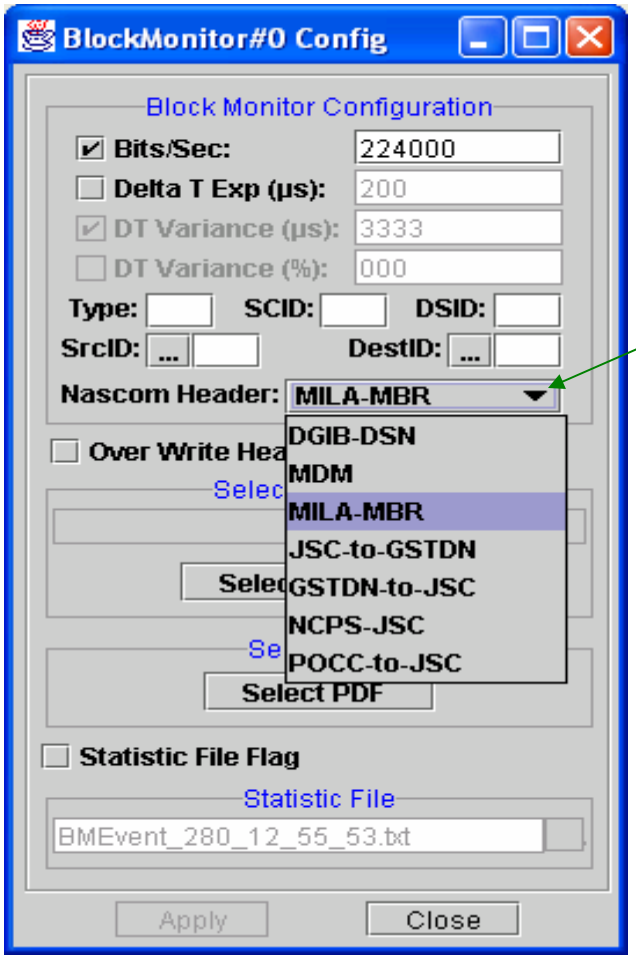
Allows the user to create a text file of error events

Where you see this it indicates a drop down window. In this case this is linked to the database for Source/Destination Codes

Allows the user to overwrite the Block Time with the current system time. The new time is in the block output on Channel 2

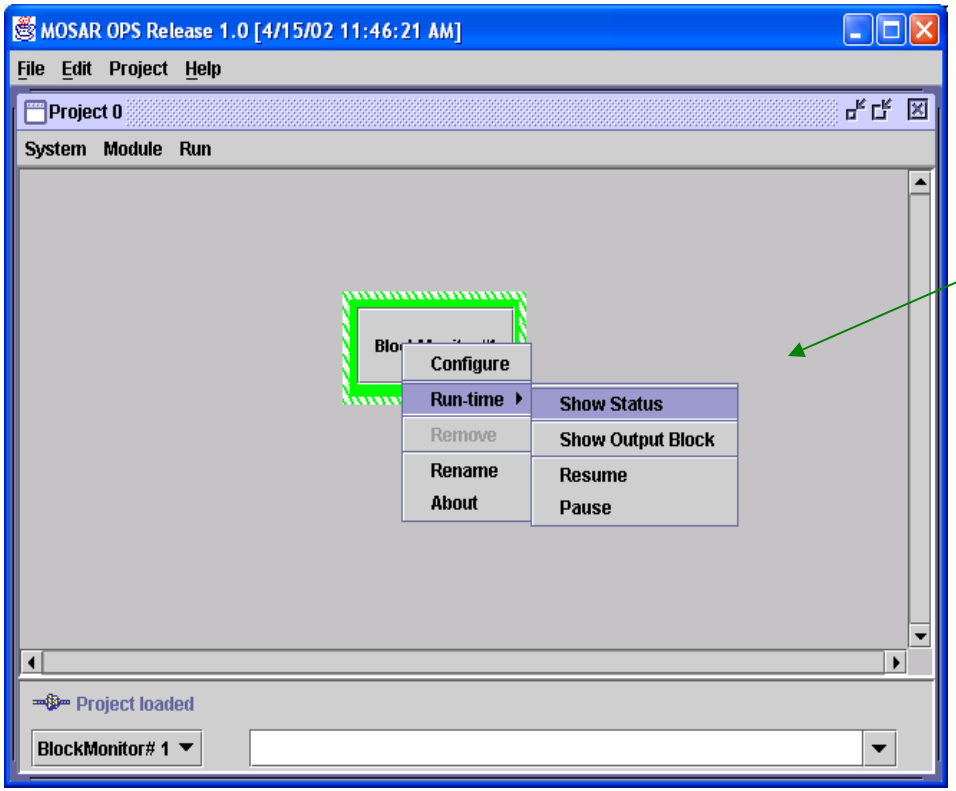
Allows the user to select different databases

Selecting a Block Type



Selecting this Drop Down allows the user to select the desired Block Type

Block monitor Run Time



Use the drop down menu to open the status and raw data display.

Block Monitor Status Display

Displays the System time and the time from the block header

# of bits per second received

Size of the block in bytes

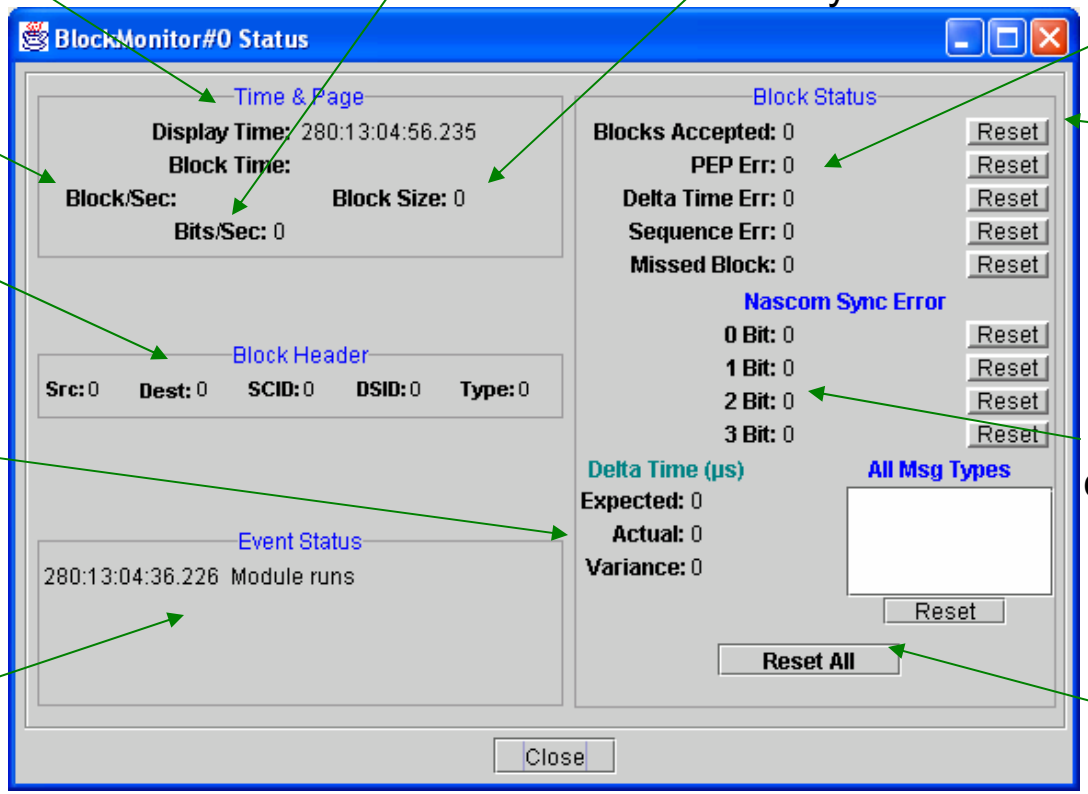
Displays the block status.

# of Blocks per Second

Octal displays of block header

Calculated Block Delta Time

Displays previous 4 events and time

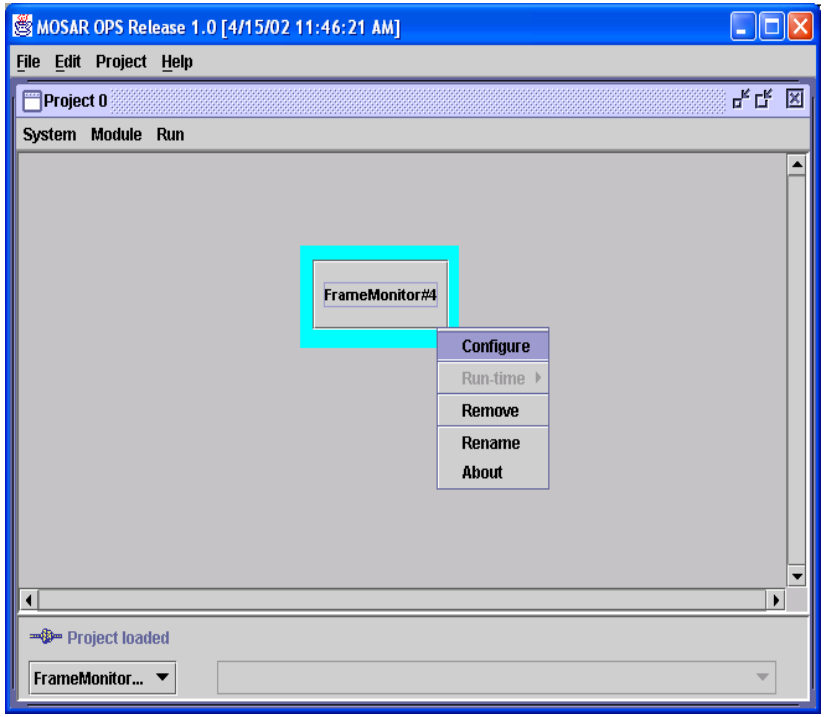


Use these to reset the individual counters

# of blocks received with sync errors, if allowed. If the sync has 0 errors the 0 Bit will count

This button resets all counters

Frame Monitor



The Frame Monitor Module has 1 Input Channel and 1 Output Channel

It is a Run Time Configurable Module but it also can be configured when it is not running

Frame Monitor Configuration

Select the # of Syncs to check for prior to locking. In Command Mode it will lock on a single occurrence of frame sync. In Telemetry Mode after Sync is detected it will not go to lock unless it detects sync at the start of the next frame

Enter up to 32 bits of the sync pattern in Hex

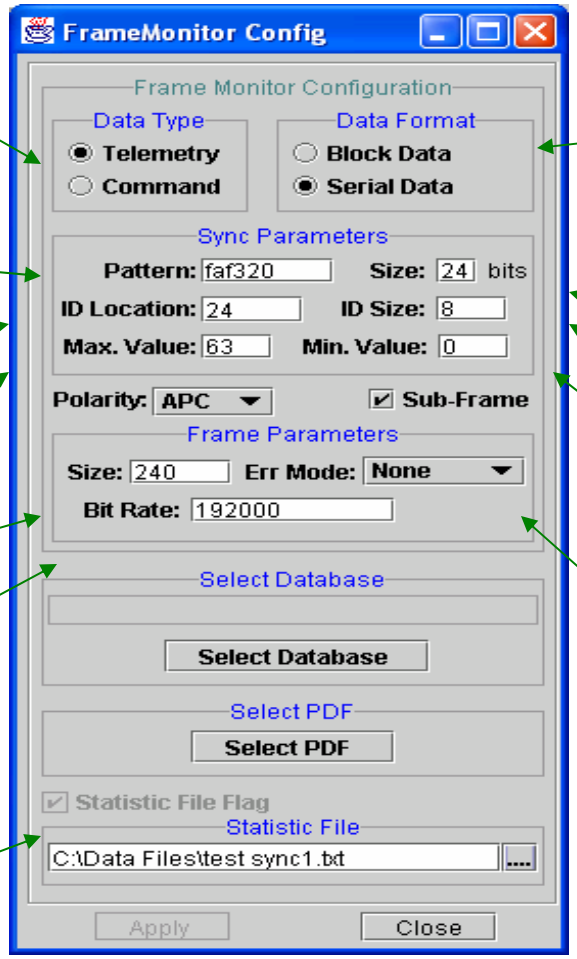
Bit location for the start of the subframe counter. The frame starts with bit 0

Maximum count in Hex

Frame size in bytes

This is used to verify the lock status

When checked the system will create a statistic file and store it where the user has specified



Use Block Data when connection to Channel 3 of the Block Monitor.

Use Serial Data when connecting to Channel 1 of Block Monitor or any other module

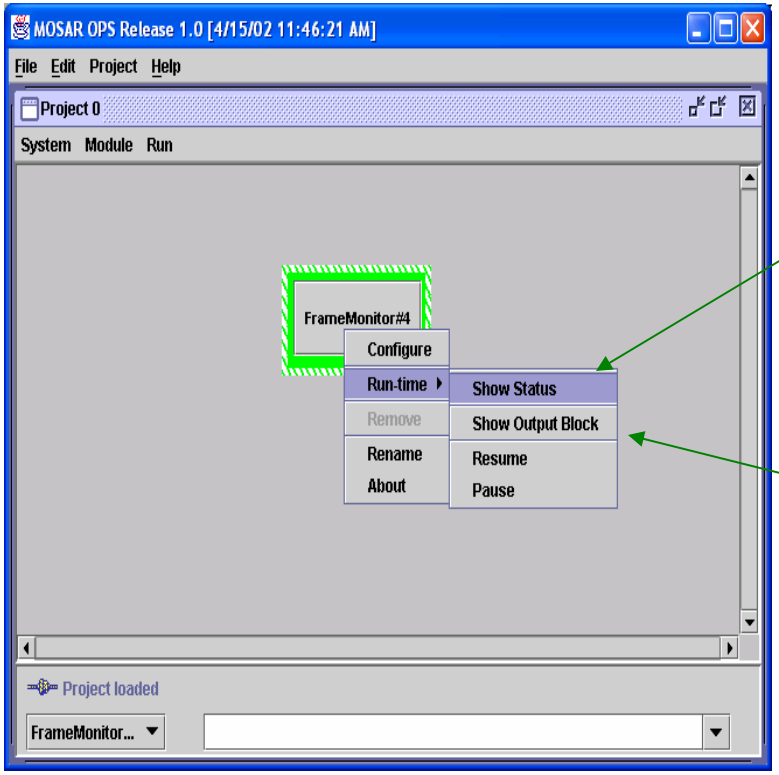
Sync Length

Subframe counter size

Minimum Subframe counter

Allows for up to 3 bits of error in the frame sync pattern

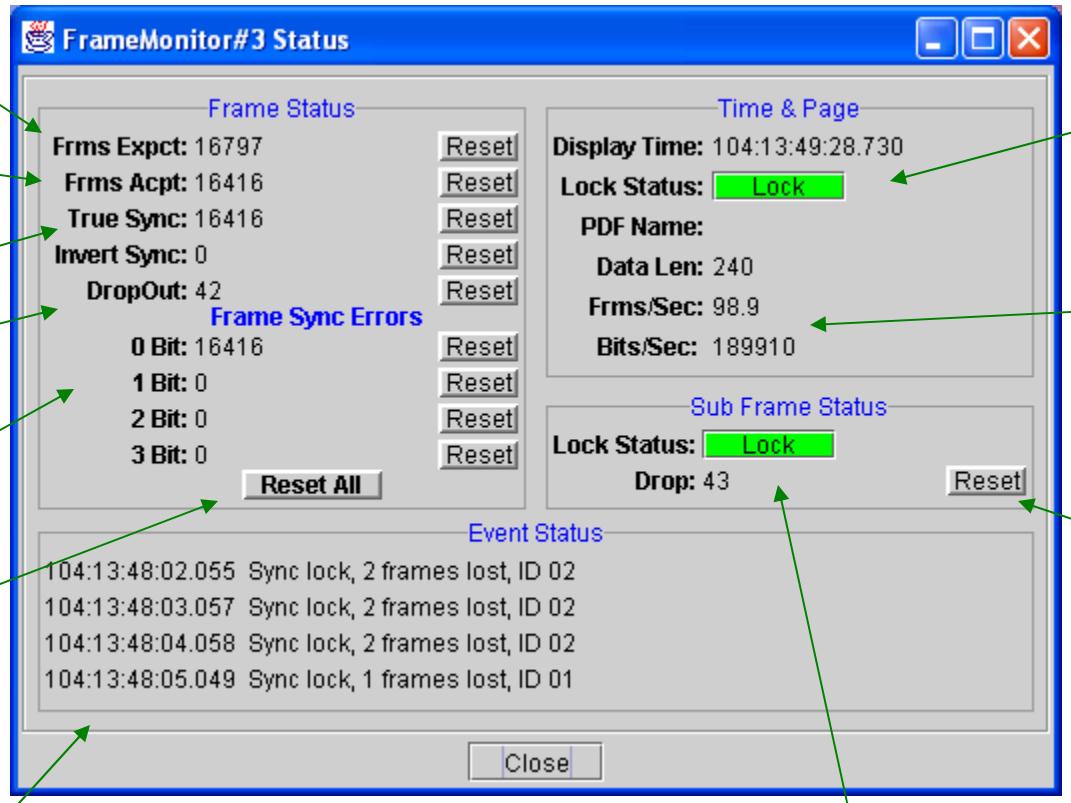
Frame Monitor



Open the Status Window

Open the dump window

Frame Monitor Status



Frames Expected based on the Bit Rate/Frame Length Calculation

Total number of Good Frames

Total number of frames with true sync and inverted sync

Total number of drop outs

Total number of frames with 0 bit errors, 1 bit error, 2 bit errors, or 3 bit errors, if selected.

Clears all counters

Display of last four sync events

Frame Lock Status

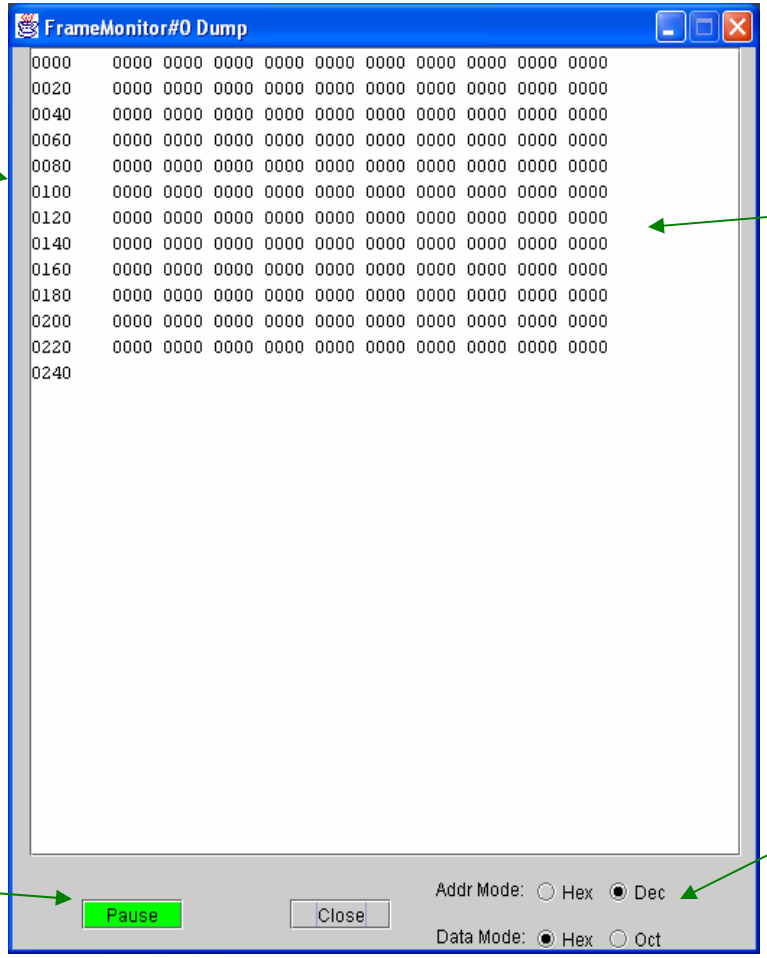
Calculated Bit rate and Frames/Second

Clears Subframe drop counter

Subframe Lock Status and Drop Count

Frame Monitor Dump Display

Byte Address



Data Field

This display is representative of the data dump displays used in the system. The settings seen here also apply to those.

Allows the User to Freeze the Screen

These settings allow the user to display the information in Hex or Octal and allows for the Address to be displayed in Hex or Decimal

Statistic File Telemetry Mode

Header Information

Frame Size and Data Rate

- FRAME MONITOR EVENT LOG DATA
- Date and time created: 104:13:51:53.358
- Frame Size: 240 bytes
- Data Rate: 192000 bps
- 104:13:51:53.358 Module runs
- 104:13:51:58.525 Sync lock
- 104:13:52:06.977 Frame drop, last good minor frame ID 63
- 104:13:52:06.997 Sync lock, 1 frames lost, ID 01
- 104:13:52:07.989 Frame drop, last good minor frame ID 63
- 104:13:52:08.009 Sync lock, 1 frames lost, ID 01
- 104:13:52:08.990 Frame drop, last good minor frame ID 63
- 104:13:52:09.010 Sync lock, 1 frames lost, ID 01
- 104:13:52:09.992 Frame drop, last good minor frame ID 63
- 104:13:52:10.012 Sync lock, 1 frames lost, ID 01
- 104:13:52:16.010 Frame drop, last good minor frame ID 63
- 104:13:52:16.030 Sync lock, 1 frames lost, ID 01
- 104:13:52:17.012 Frame drop, last good minor frame ID 63
- 104:13:52:17.032 Sync lock, 1 frames lost, ID 01
- 104:13:52:25.624 Frame drop, last good minor frame ID 3B
- 104:13:52:25.634 Module stops

The Statistic File logs the sync lock and drop times to the file specified in the Frame Monitor Configuration. It consist of a time tag, lock status, and minor frame information.

The time is the Block Time the event was detected in if the module is connected to output port 3 of the Block Monitor and the Module is configured to block mode. If the module is configured to serial mode this will be the system time.

The Frame Drop or Sync Lock indication comes from the sync detect logic.

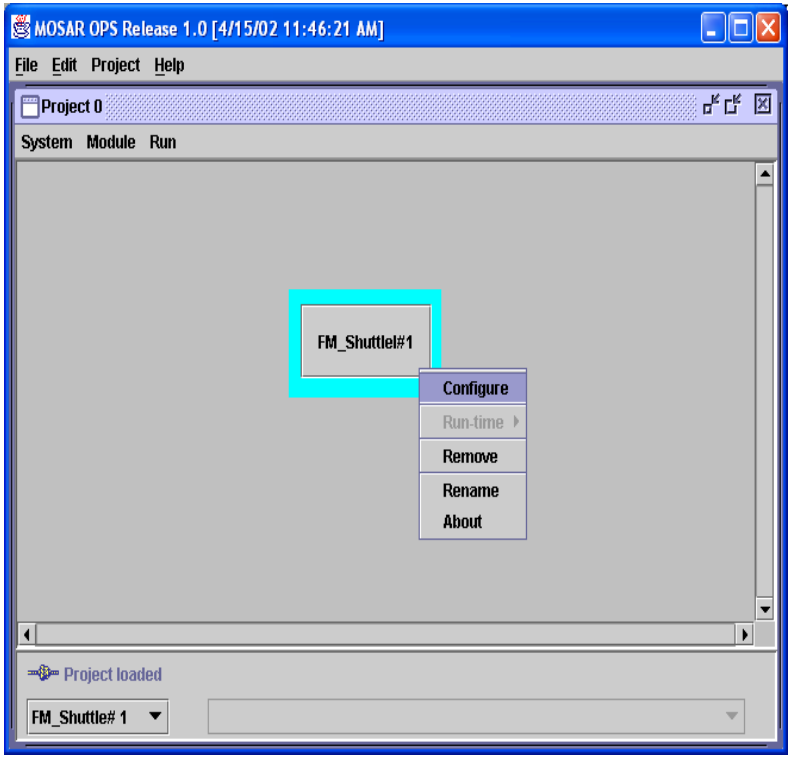
The # of frames lost is based on a calculation of last good frame, lock frame, and time.

Statistic File Command Mode

In Command Mode, the Statistic File logs every time the sync detect logic records sync. It only records the time if the frame monitor is not locked. Care must be made when configuring the frame monitor to enter a bit rate that will allow the frame monitor to drop out.

- FRAME MONITOR EVENT LOG DATA
- Date and time created: 104:14:05:47.998
- Frame Size: 240 bytes
- Data Rate: 192000 bps
- 104:14:08:47.596 Module runs
- 104:14:09:01.136 Sync found
- 104:14:09:01.136 command found
- 104:14:09:02.638 command found
- 104:14:09:03.639 command found
- 104:14:09:05.642 command found
- 104:14:09:07.645 command found
- 104:14:09:08.646 command found
- 104:14:09:09.648 command found
- 104:14:09:11.641 command found
- 104:14:09:12.642 command found
- 104:14:09:13.644 command found
- 104:14:09:14.645 command found
- 104:14:09:15.646 command found
- 104:14:09:16.648 command found

Frame Monitor Shuttle



The Frame Monitor Shuttle is designed for supporting Orbiter D/L. It has 1 Input Channel and 1 Output Channel.

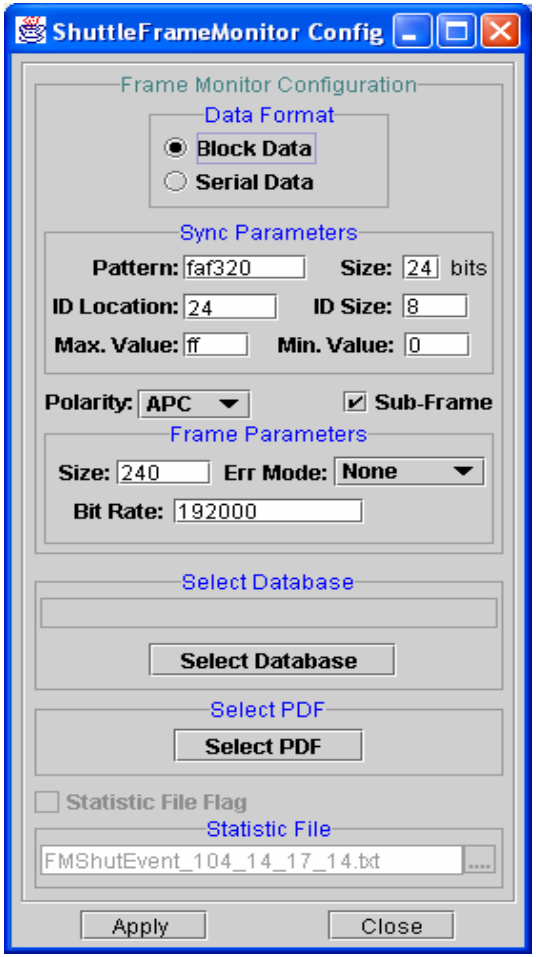
It is a Run Time Configurable Modules, but it also can be configured when the module is not running

Frame Monitor Shuttle Configuration

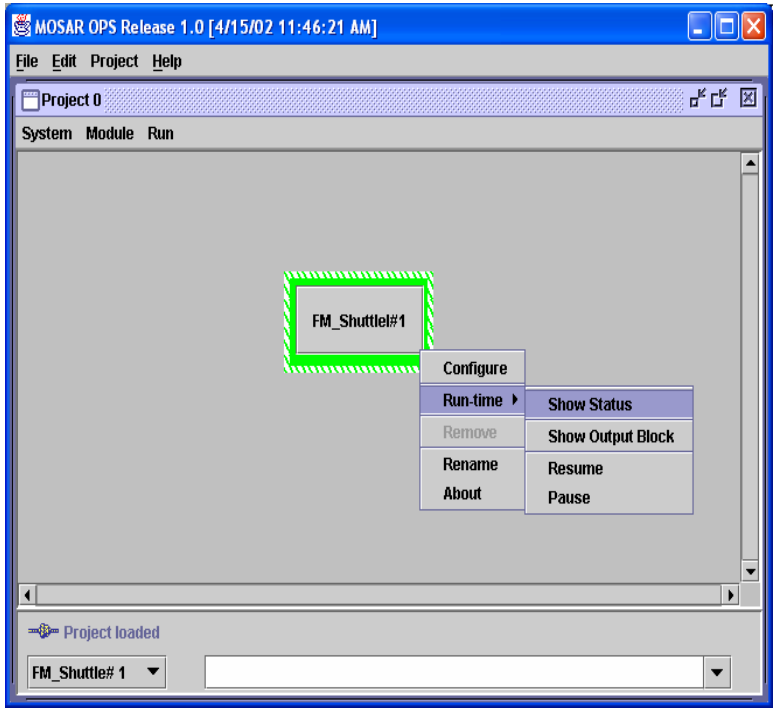
The user configures this module the same way that the Frame Monitor Module is configured.

This module is designed to be connected to Block Monitor Channel 3 as the source of data.

Selecting Block Data allows the Block Time to be used for the Statistic File. Selecting Serial Data allows for the use of System Time.



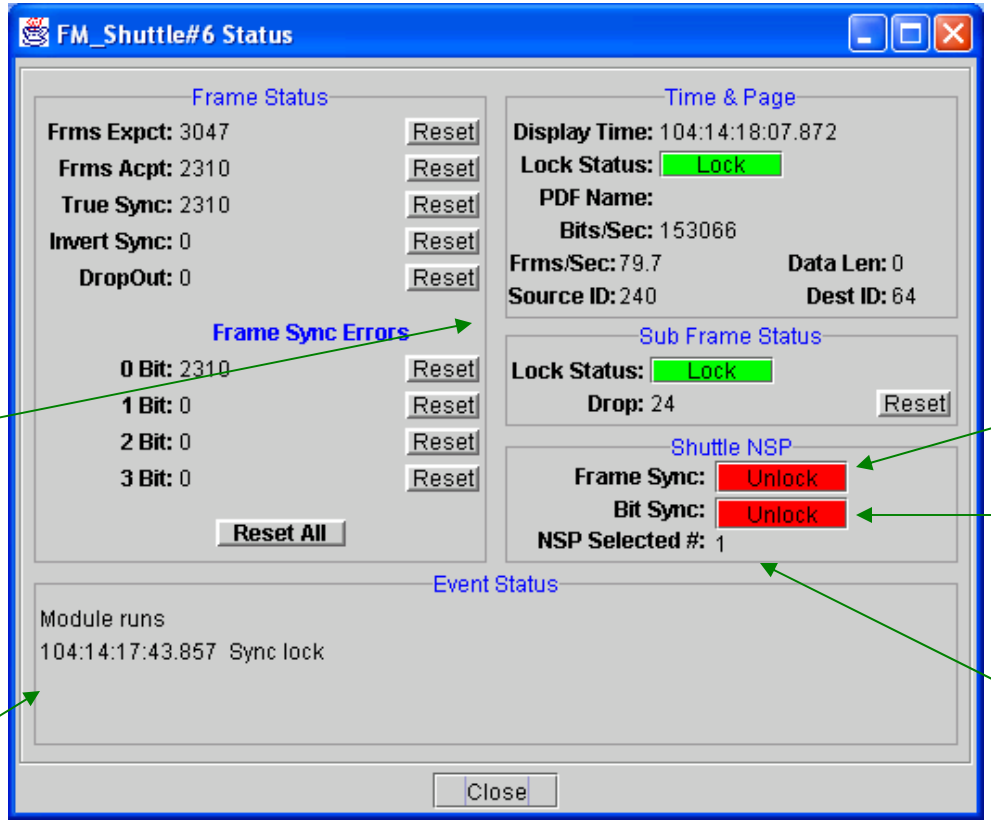
Frame Monitor Shuttle Run Time



The Frame Monitor Shuttle uses the standard Configure, Run Time drop menus.

Frame Monitor Shuttle Status

This status display is exactly like the Frame Monitor Module Status Display with the following exception



Source and Destination obtained from the NASCOM Block. This information is attached to the raw telemetry by the Block Monitor

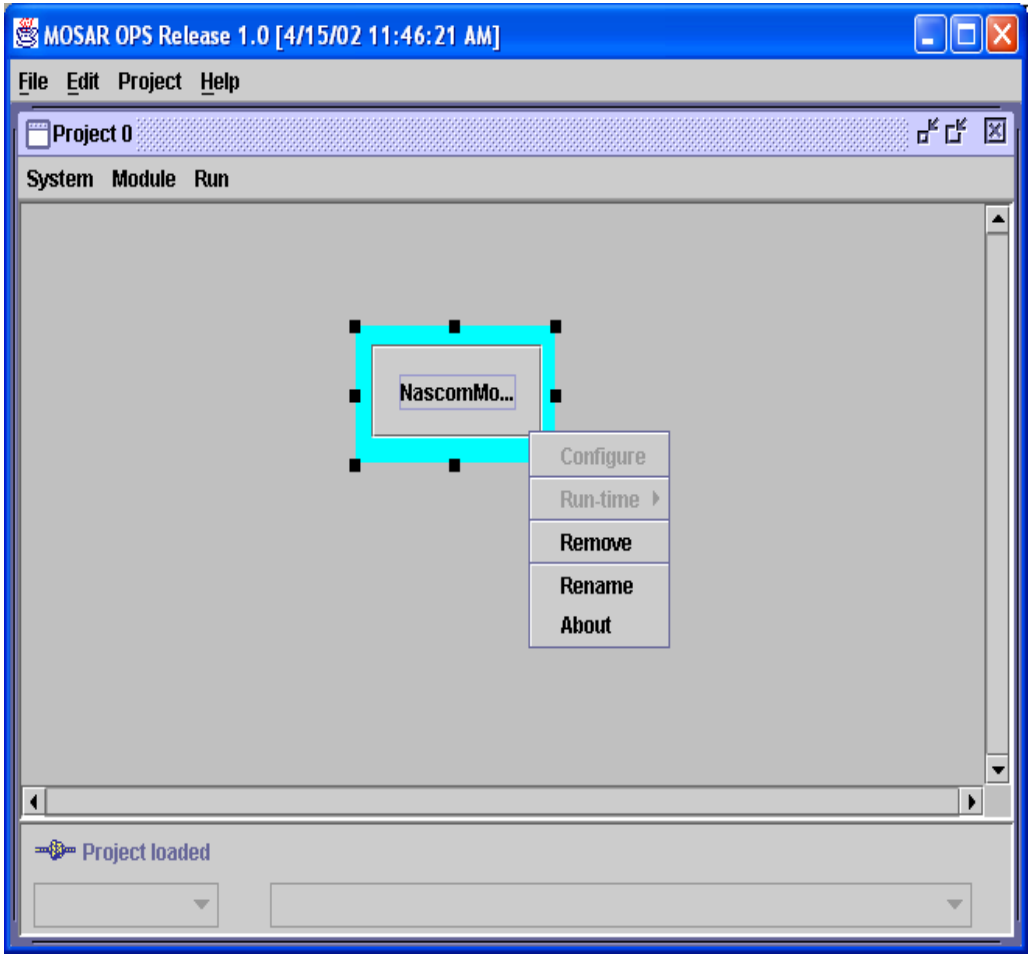
Lock Status of the NSP Frame Sync

Lock Status of the NSP Bit Sync

Displays which NSP is selected in the TLM stream

Displays the Frame Lock Status and times for the last four lock events

NASCOM Monitor

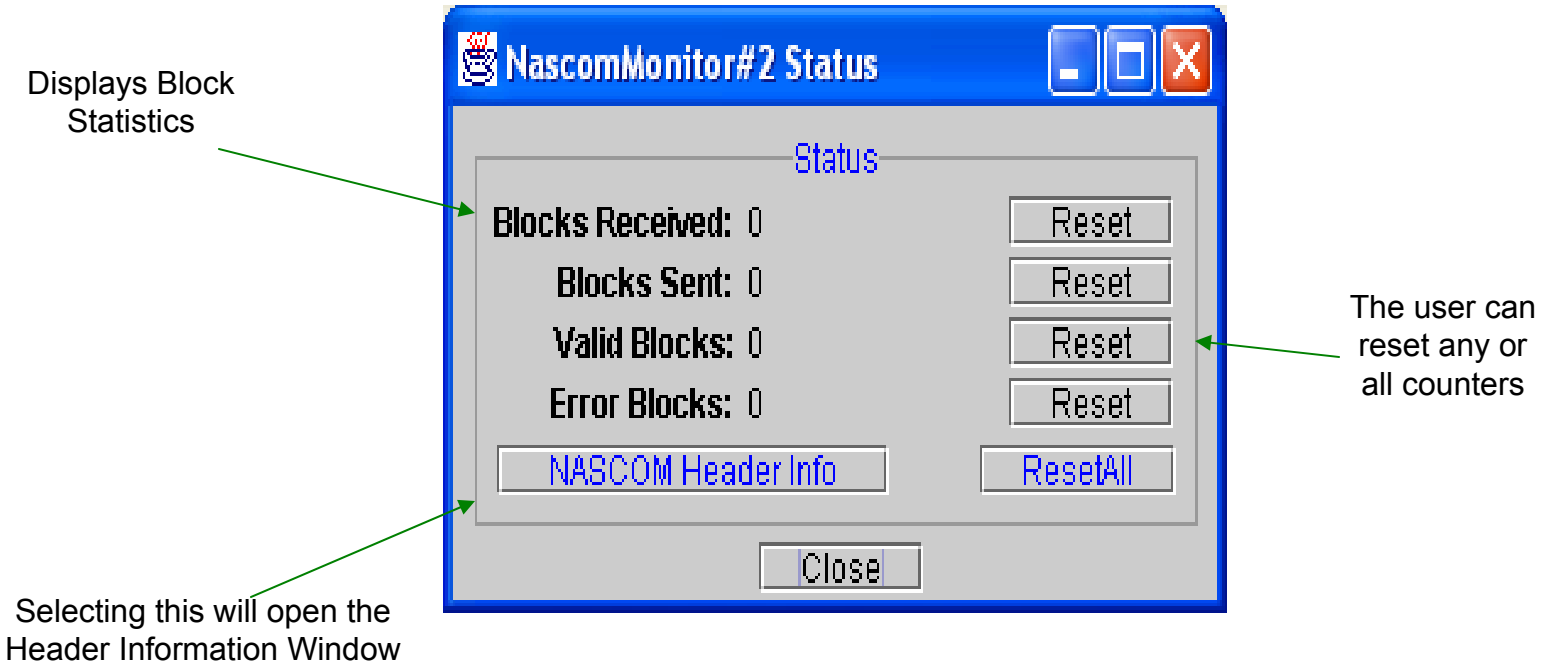


The NASCOM Monitor Module has 1 Input Channel and 1 Output Channel.

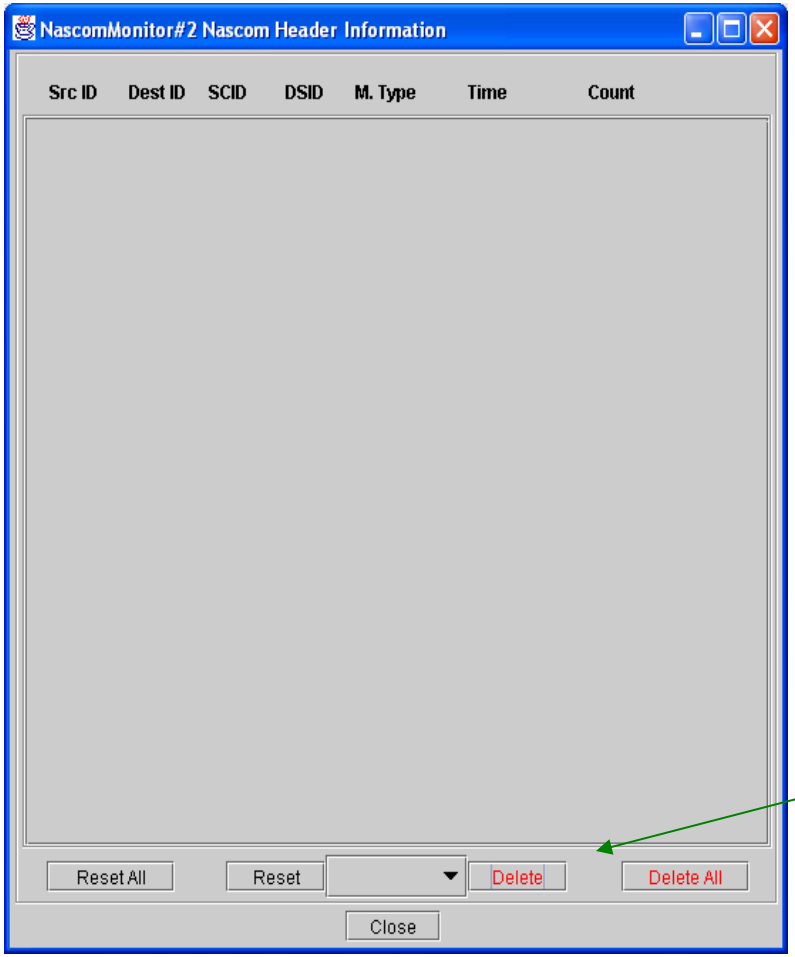
It has a set configuration. It requires a NASCOM Block with a RTP Header attached.

It is used for Validating the RTP header and Displaying the Header information. This is useful when you have multiple streams of NASCOM blocks on the same line.

NASCOM Monitor Status



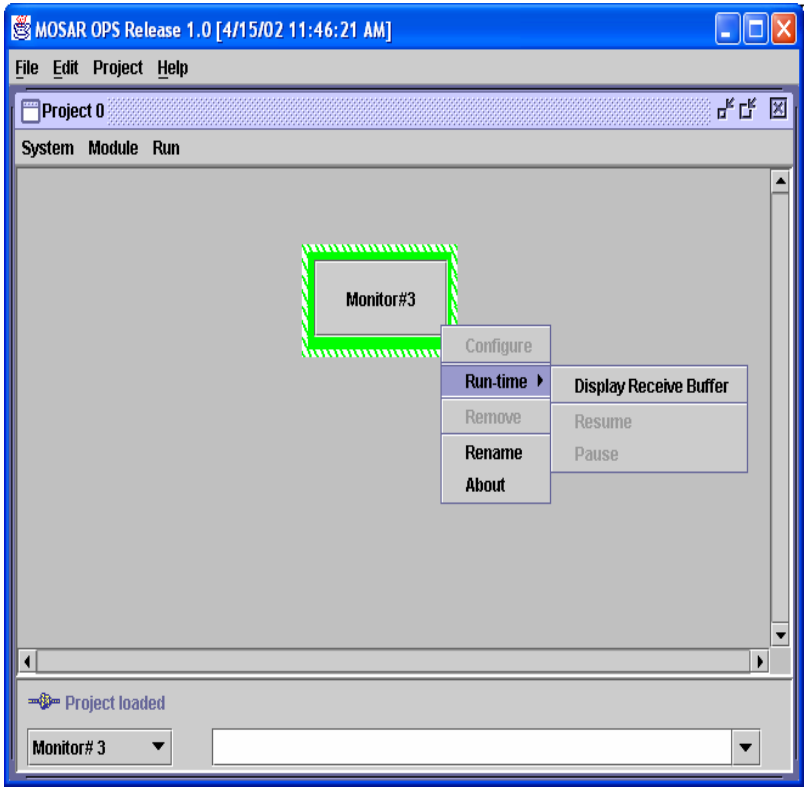
NASCOM Monitor Header Information



This display will display the header information of the blocks received by this module. Each different block will be shown on a separate line. For example if there are Shuttle Command Echos and Site Status Messages on the same data line there will be two lines on the display.

Using these buttons will allow the user to delete lines or reset counters for a specific line or for all lines.

Monitor Module

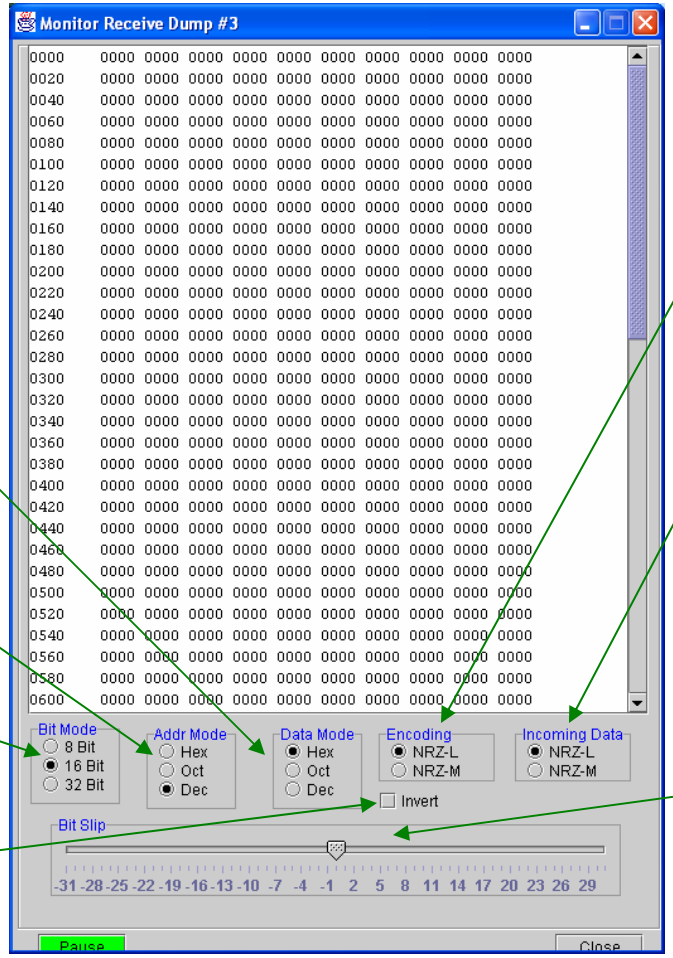


The Monitor Module has 1 Input Channel and No Output Channel.

It is not configurable.

It is a powerful test tool for displaying data.

Monitor Module Display



Allows the user to display the data in Hex, Octal, Or Decimal

Allows the address to displayed in Hex, Octal or Decimal

Allows the data to be displayed in 8, 16, or 32 bit groups

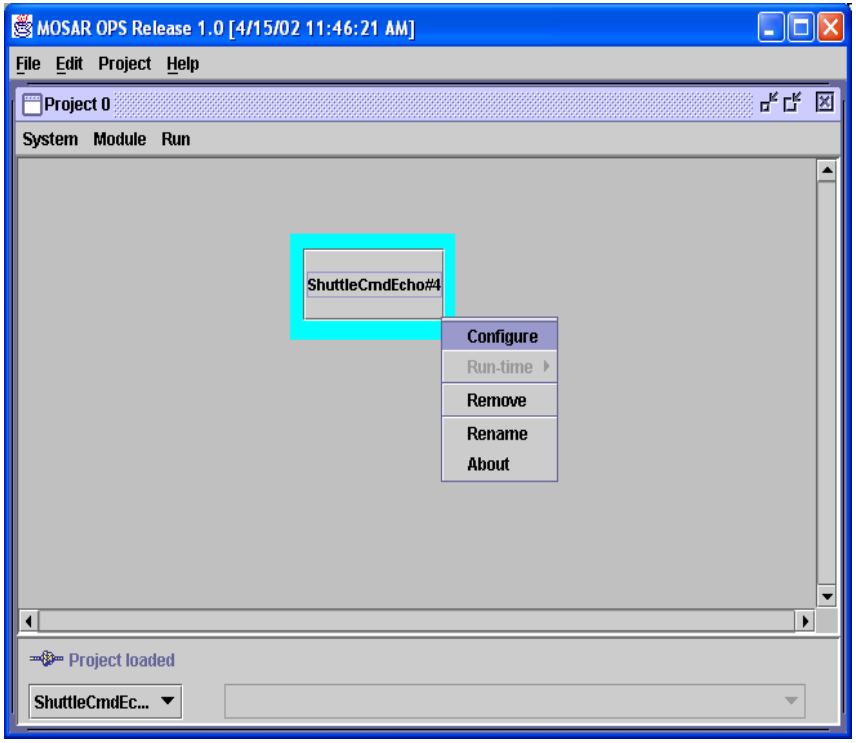
Allows the user to invert the data in the display

Allows the user to Encode the data from NRZ-L to NRZ-M or M to L

Allows the user to specify the incoming data code

Allow the user to bit shift the data to the right or to the left by up to 32 bits 1 bit at a time

Shuttle Command Echo Module



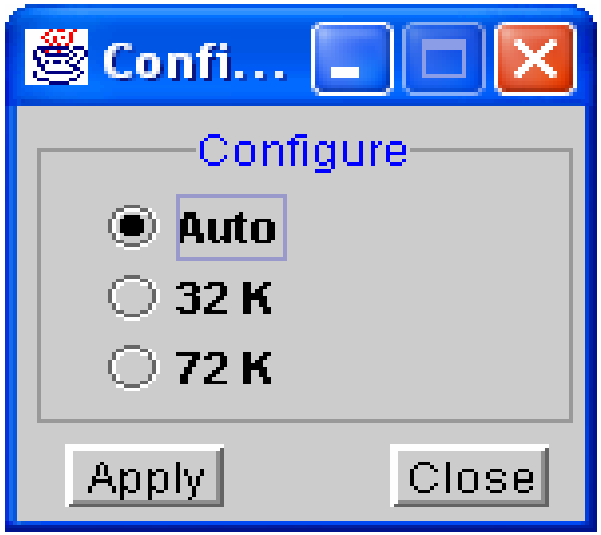
The Shuttle Command Echo Monitor has 1 Input and 1 Output.

It is a Non-Run Time Configurable Module

It requires synchronized data and outputs the orbiter command words

Shuttle Command Echo Configuration

The user can select which type of data to use, but the module will function perfectly in Auto mode.



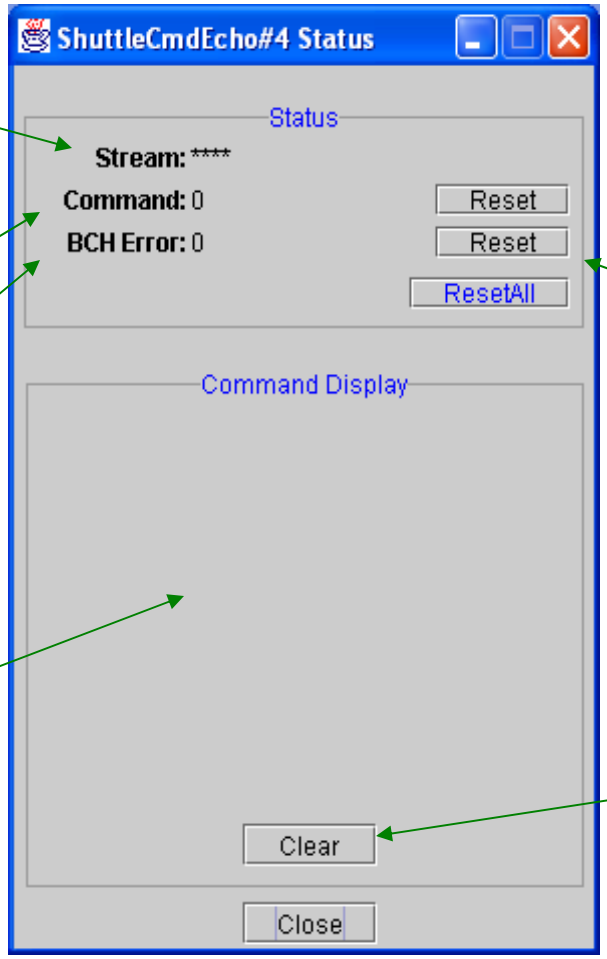
Shuttle Command Status Display

This will display the data type it receives, either 32 kbps or 72 kbps. If the module is in Auto mode it will switch to the received data type

Total # of Commands in the stream

Total # of BCH errors received

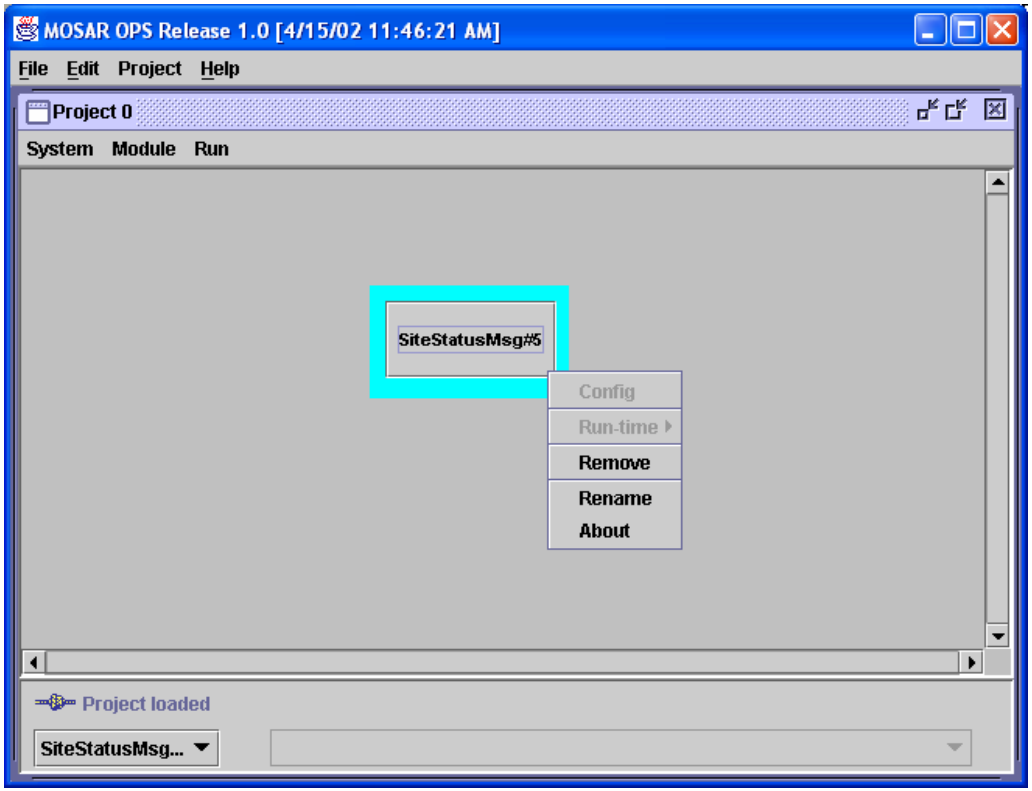
Commands will be displayed in this area



Reset the counters

Clear the Command Display area

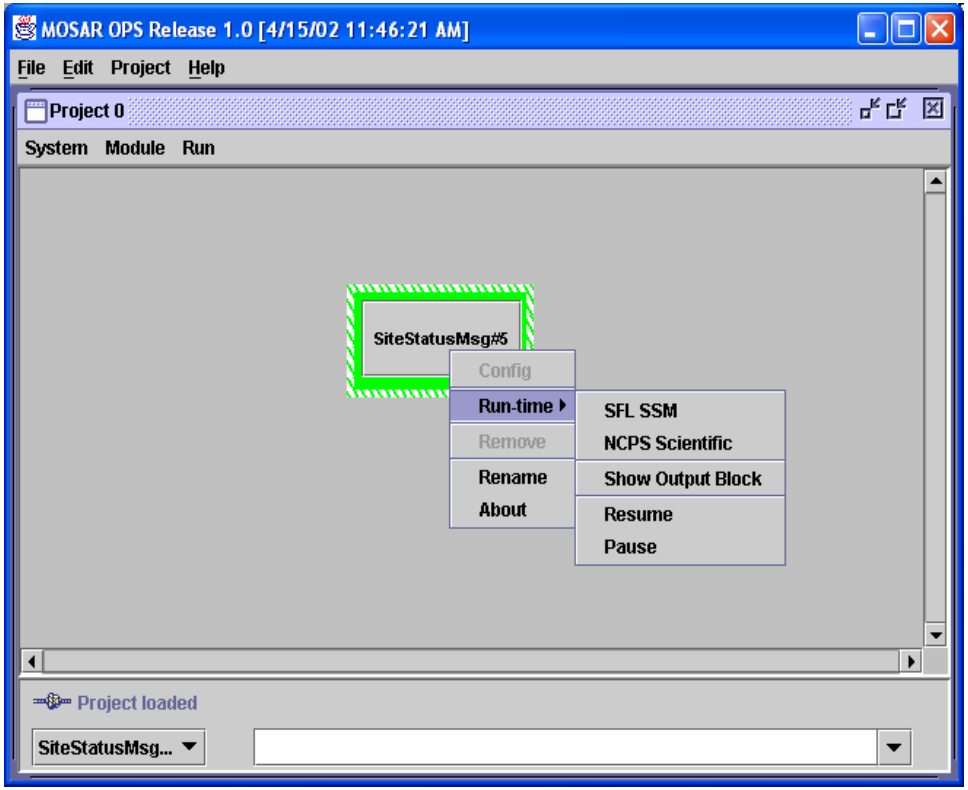
Site Status



The Site Status module has 1 Input Channel and no Output Channels.

It is a fixed configuration module

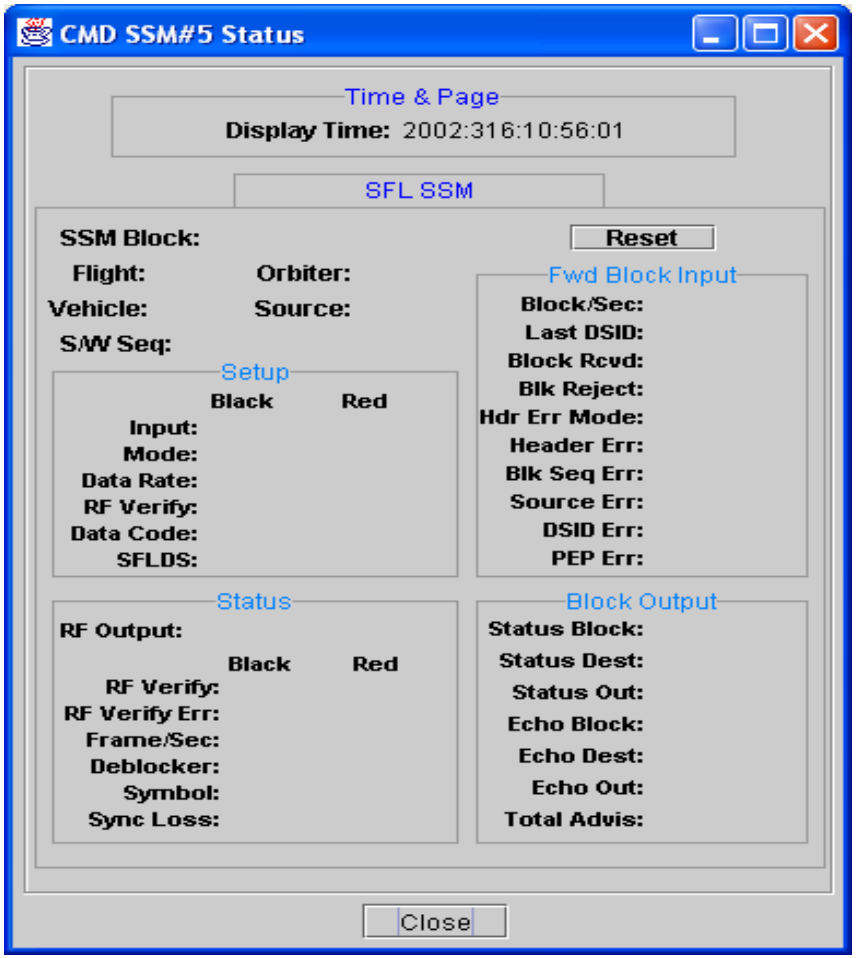
Site Status Message Run Time

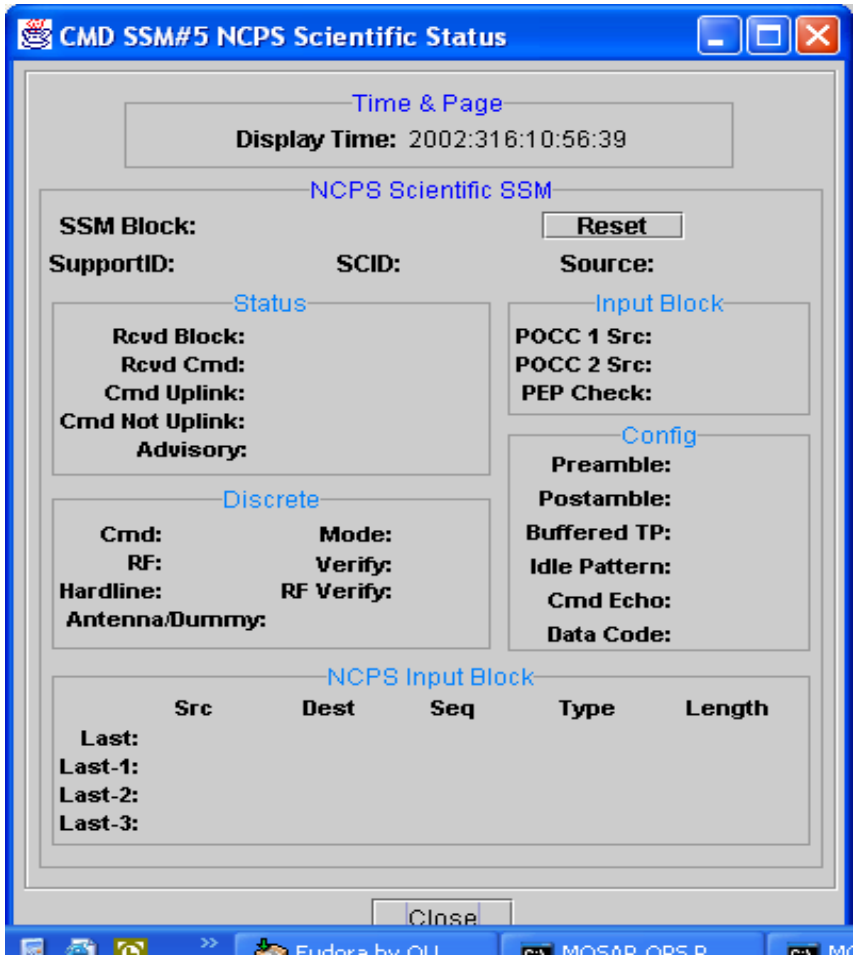


Use the Run Time Window to select the desired display.

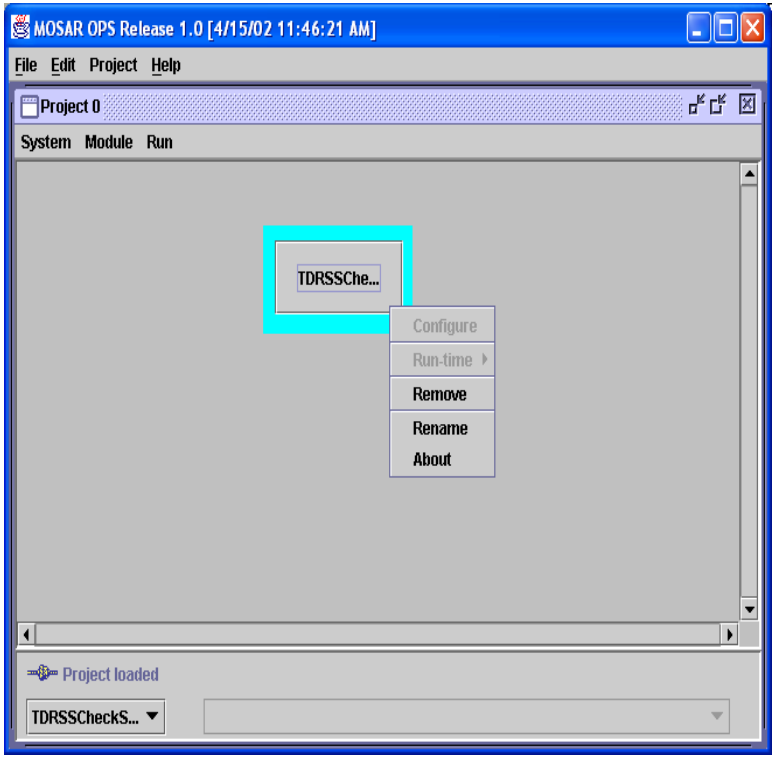
The module requires deblocked data. This can be obtained from the Channel 1 output of the Block Monitor.

Site Status Displays





TDRSS CheckSum Module

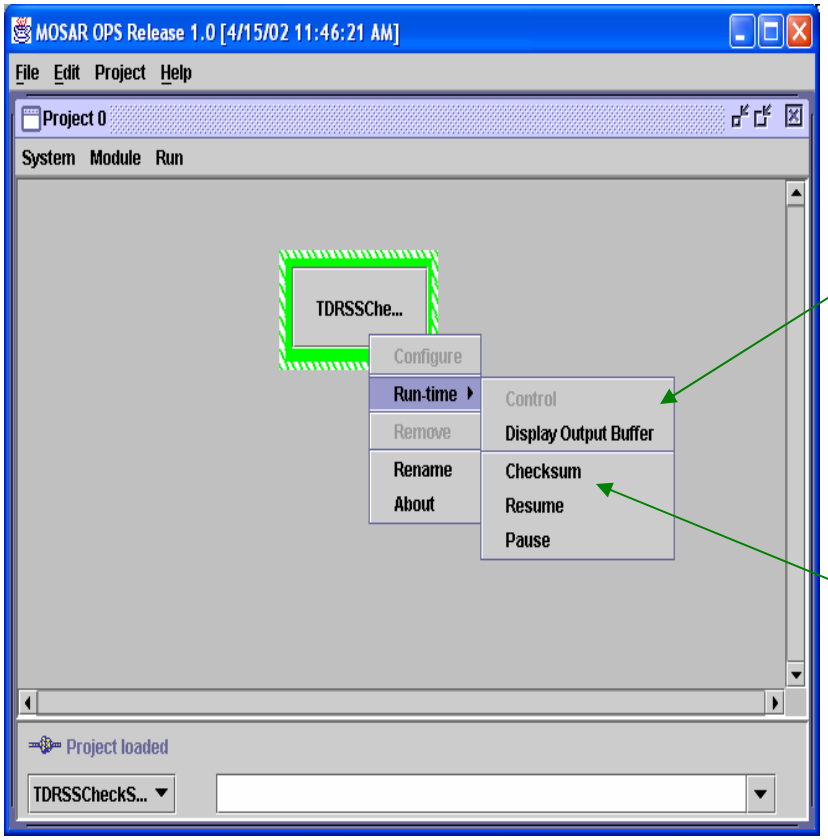


The TDRSS Checksum Module is designed to receive synchronizer 1 or 4 kbps TDRSS data.

It has 1 Input Channel and no Output Channels.

It is a fixed configuration Module

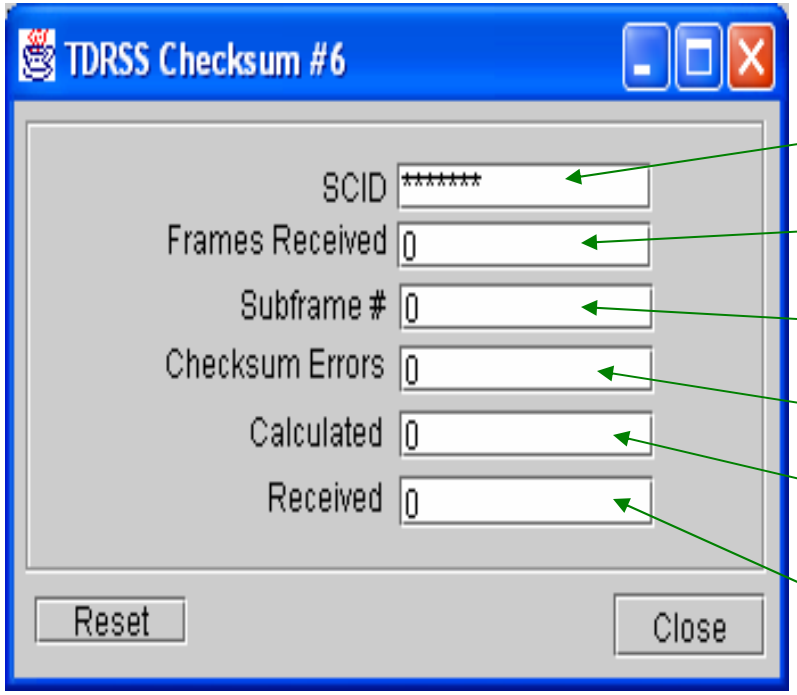
TDRSS Checksum Run Time



Access Data Display

Access Status Display

TDRSS Checksum Status Display



Spacecraft ID, This is determine from the data stream

Total # of Frames Received

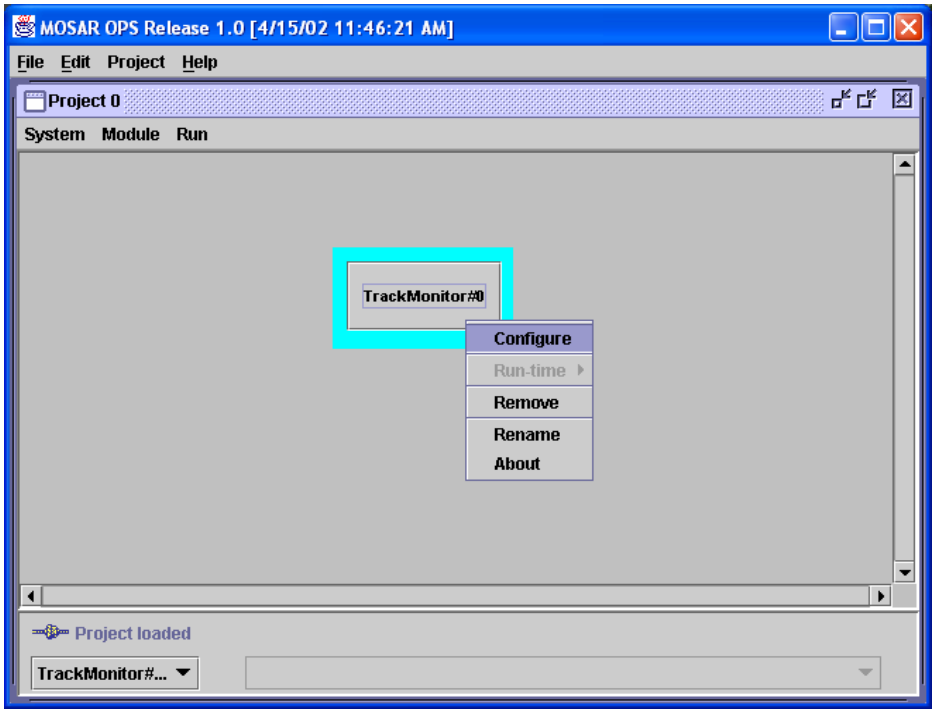
Current Subframe #

Total # of Checksum Errors

Calculated Checksum

Checksum from data stream

Track Monitor Module



The Track Monitor Module has 1 Input Channel and no Output Channels.

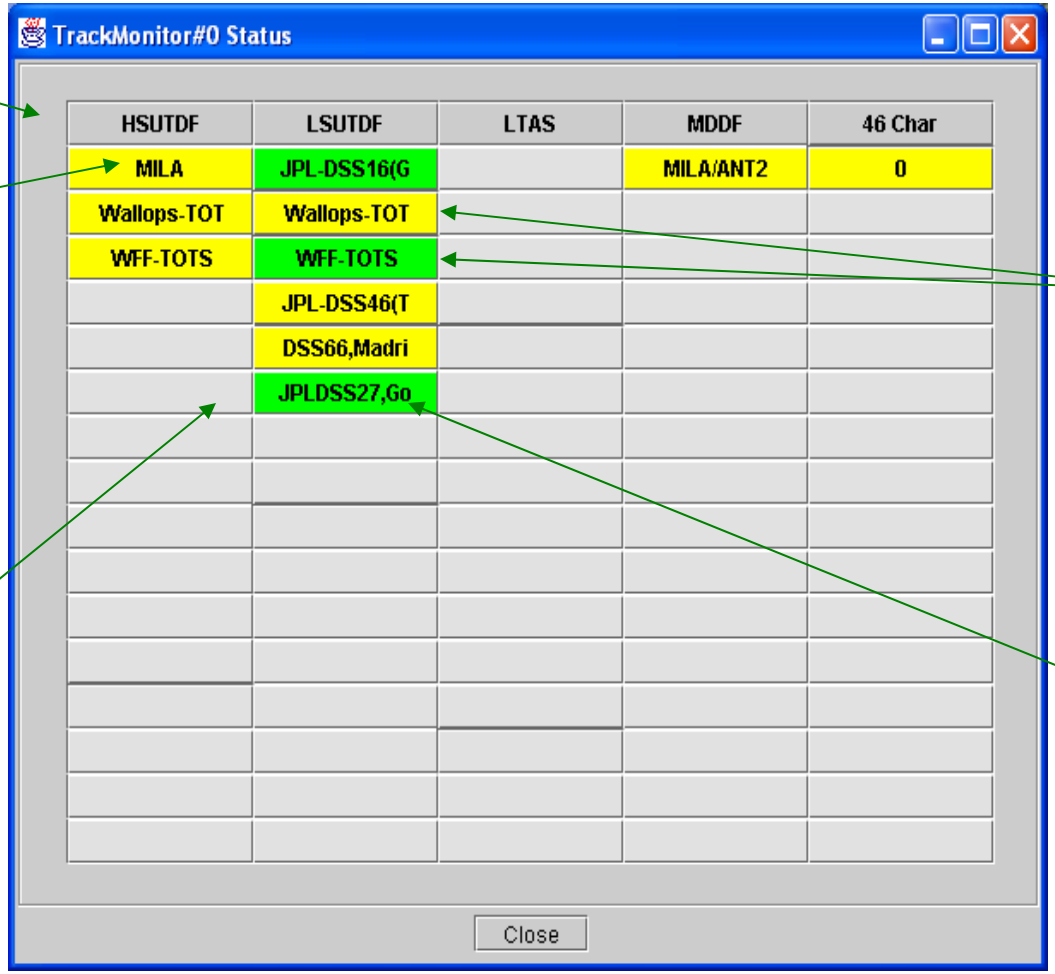
It is a Non-Run Time Configurable module. The only configuration options are the source of data. It can receive either NASCOM 4800 Bit Blocks or it can receive TTY data

Track Monitor Status Display

This row lists the type of tracking data that can be received

This indicates the source of the data

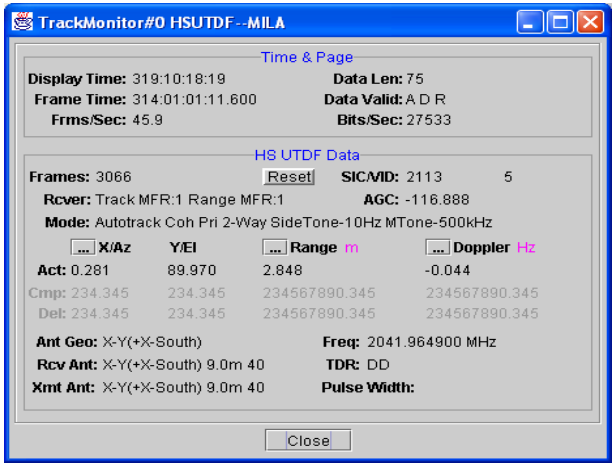
Right Clicking on a box will allow the user to see a dump of the raw data or remove the block from the display.

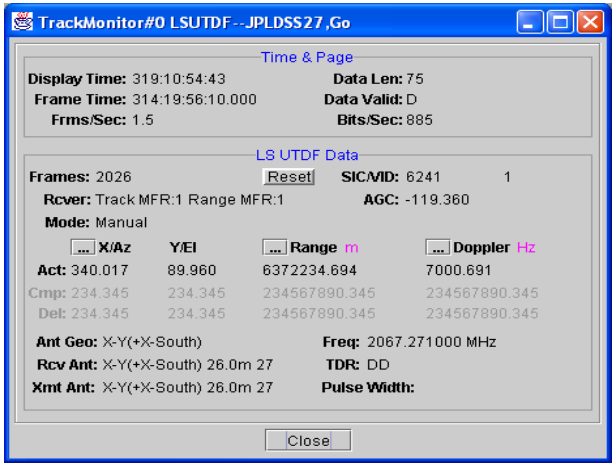


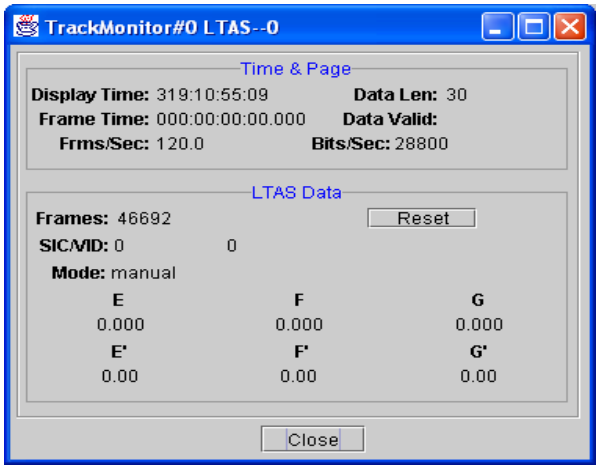
If the Box is yellow, it indicates the data is “Stale”. If the box is Green, it indicates that the data is current and still be received.

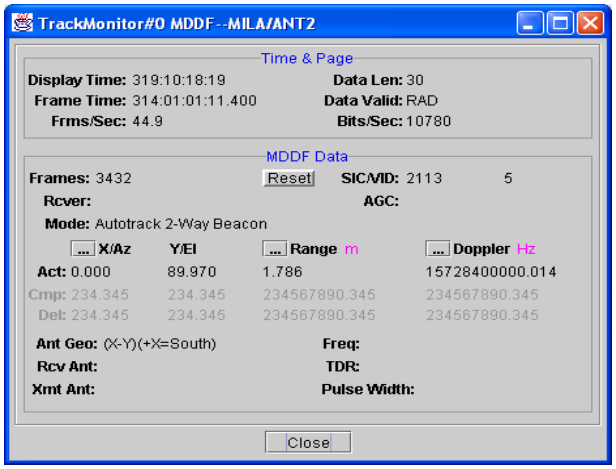
Left clicking on a box will bring up the Status window for the data

Track Monitor Display Examples

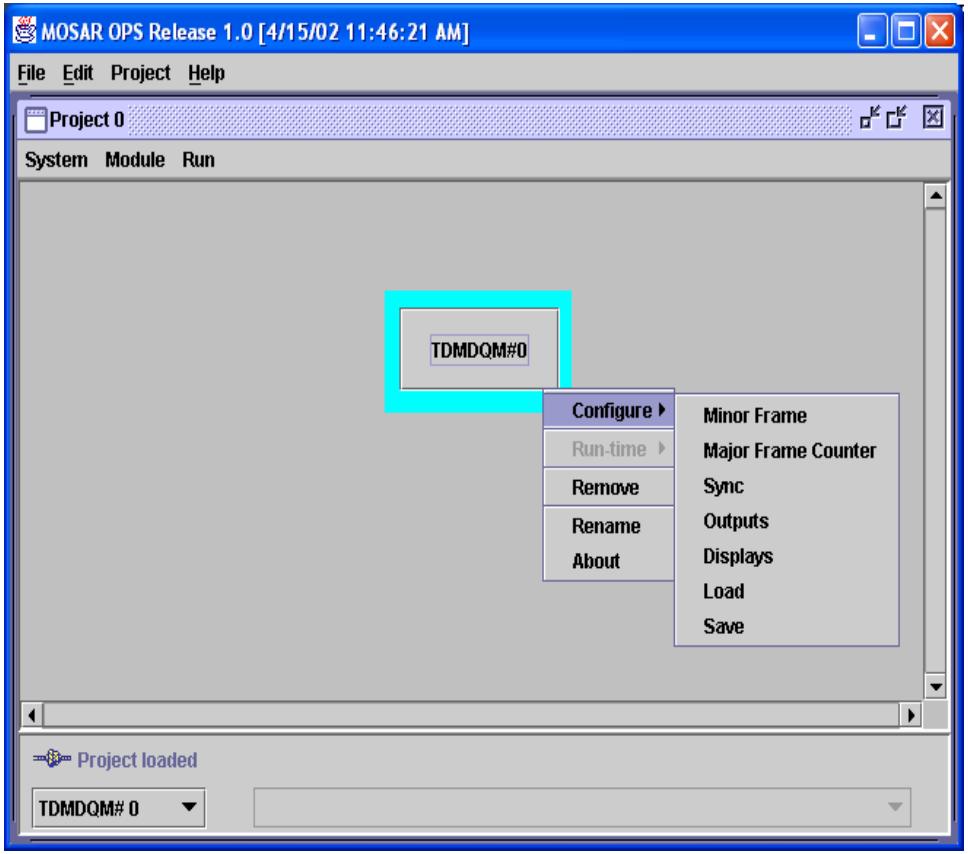








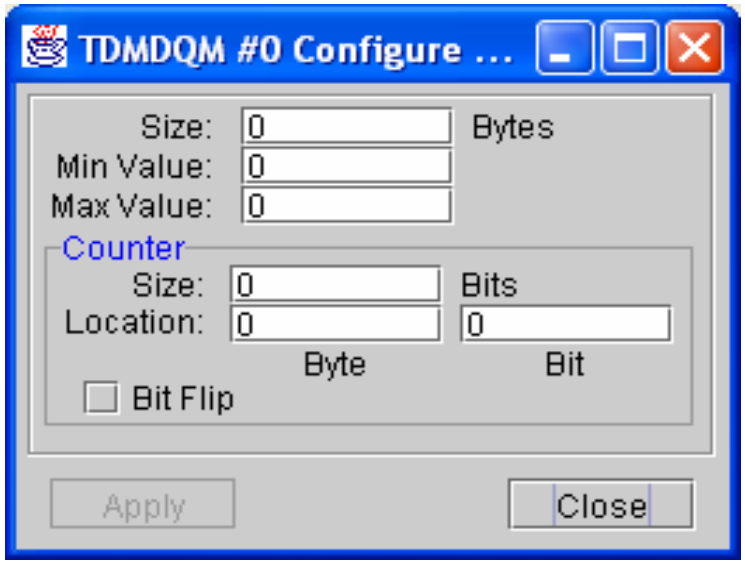
TDM DQM

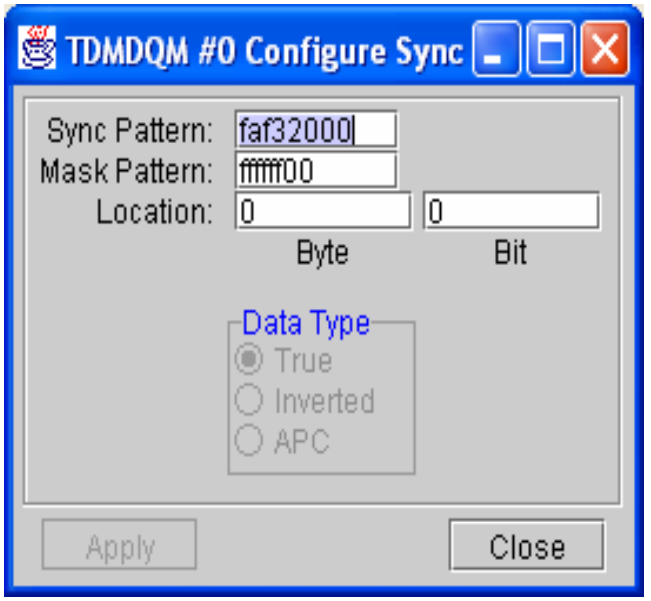


TDM DQM has 1 Input Channel and 3 Output Channels.

It is a non-Run Time Configurable Module

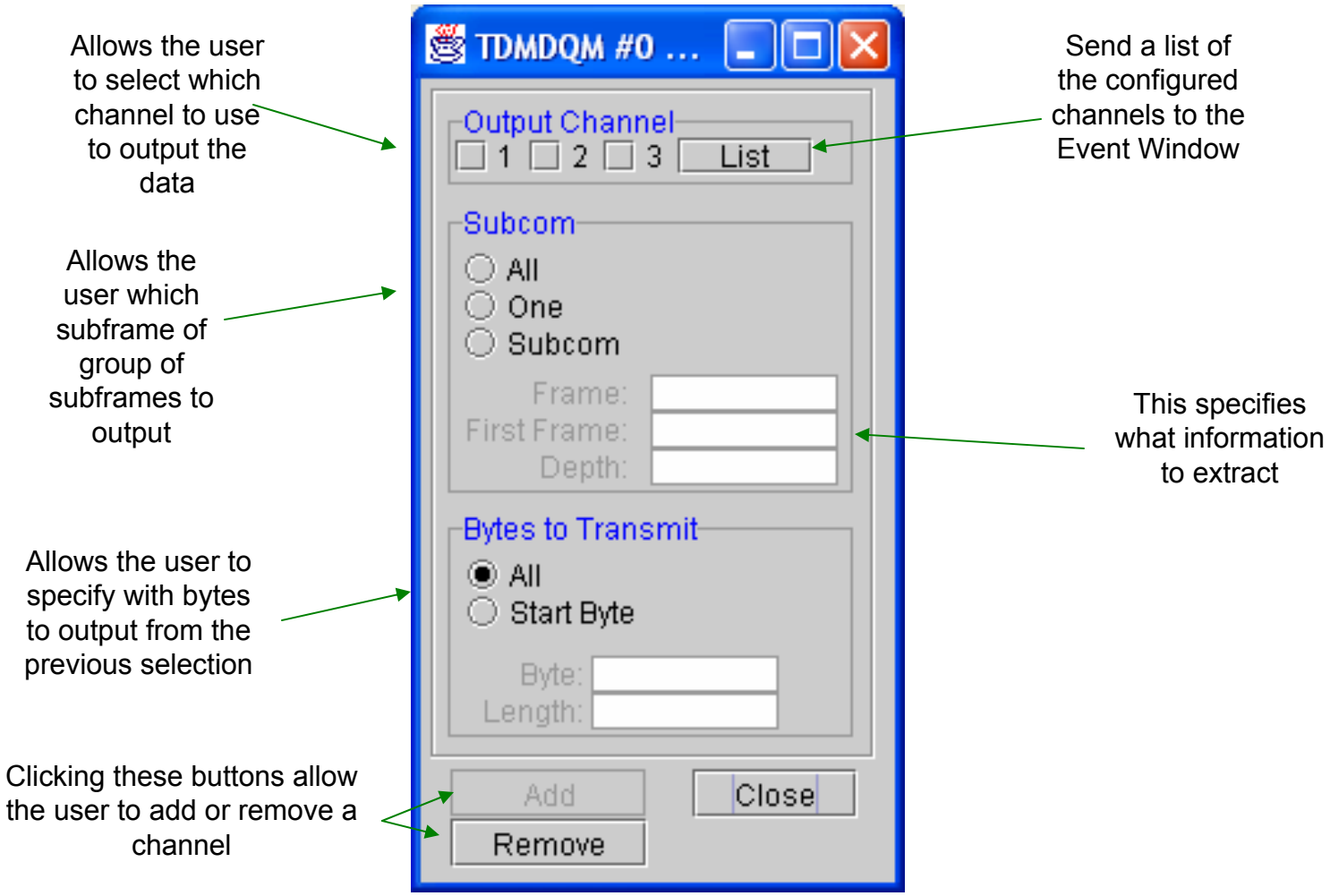
TDM DQM Configuration



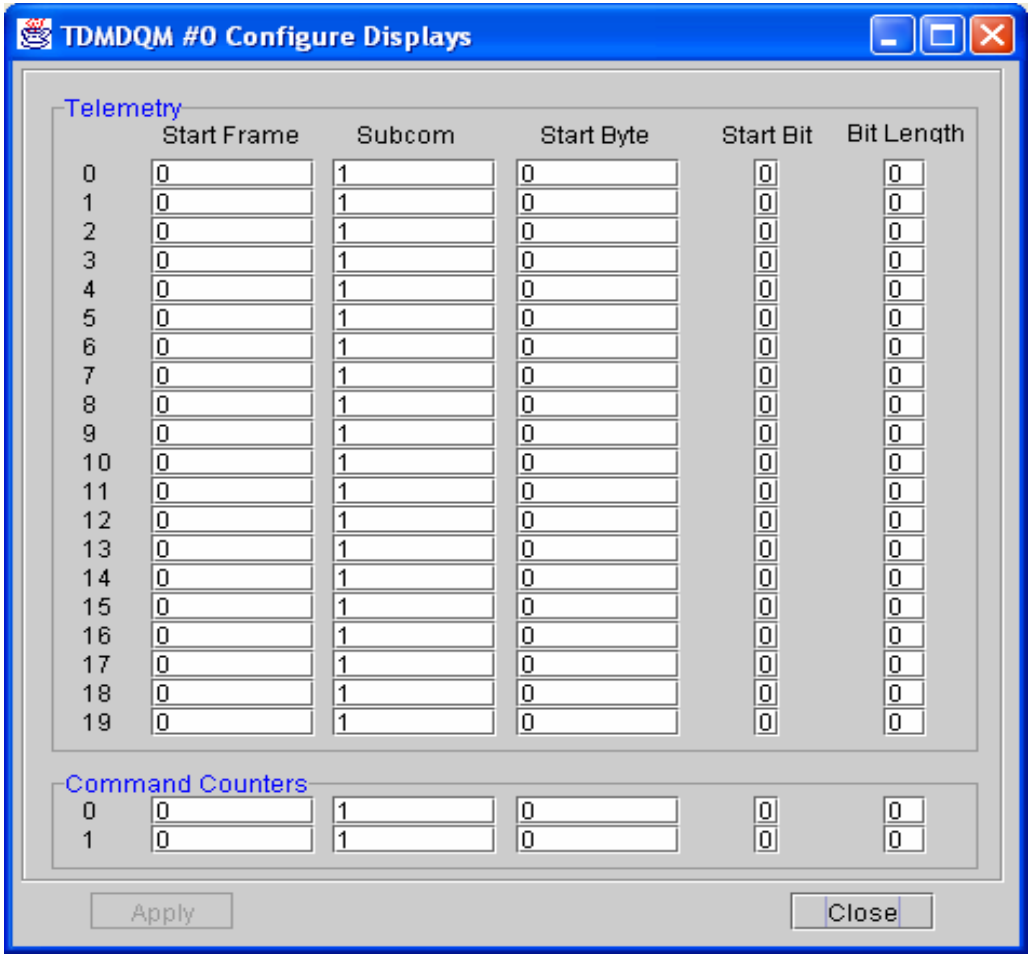


These configuration windows allow the user to specify the information required to synchronize on the TDM Data Stream. The input data stream requires the data to be synchronized by the previous module.

TDM DQM Configuration

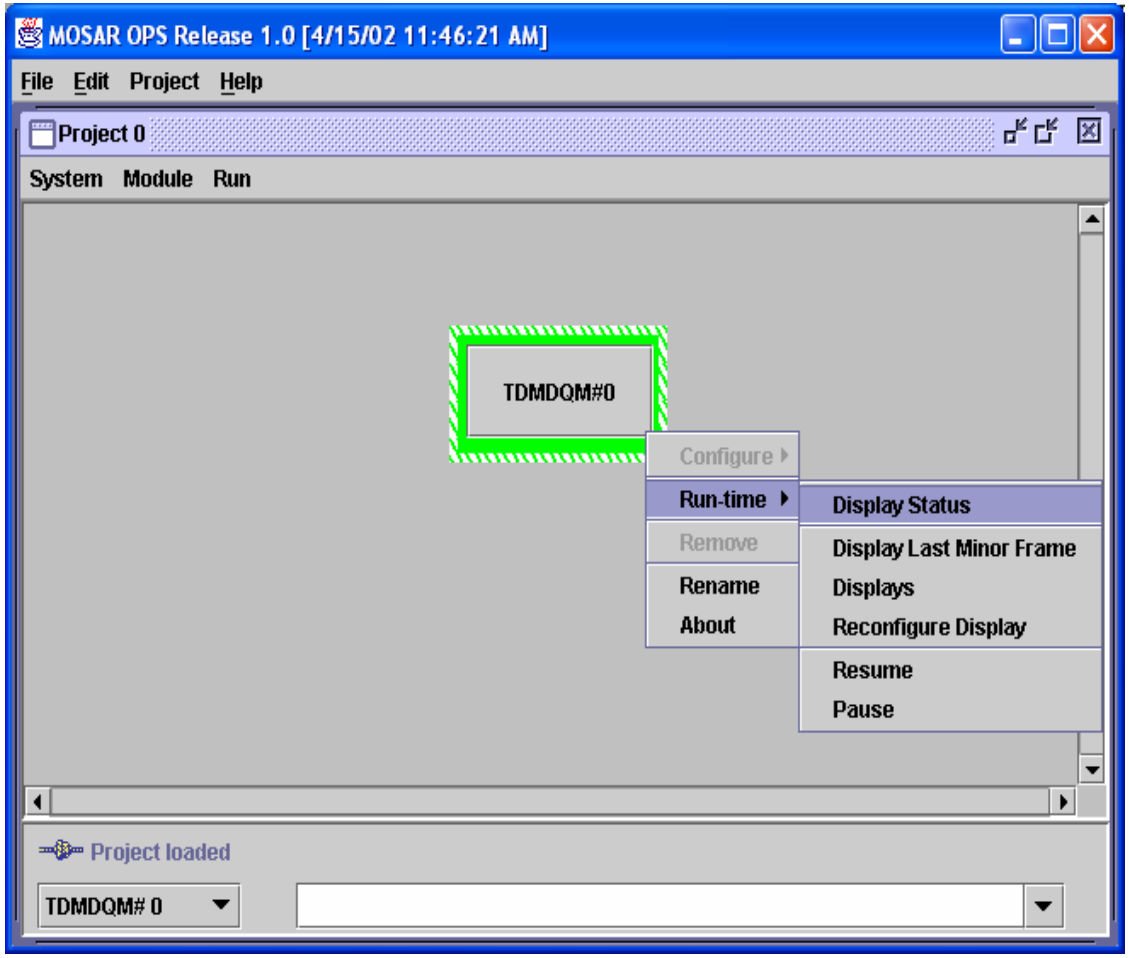


TDM DQM Configuration

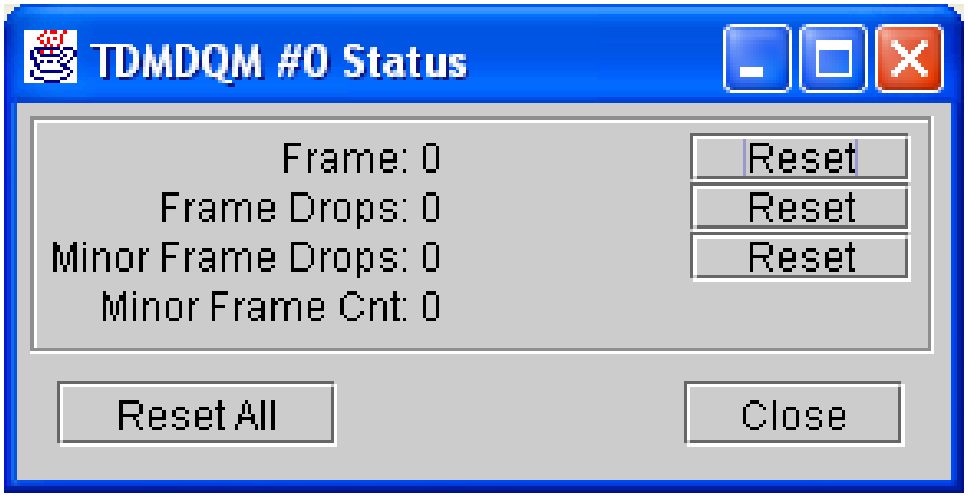


This allows the user to select individual pieces of information to be displayed. The maximum is 32 bits per displays.

TDM DQM Status Displays

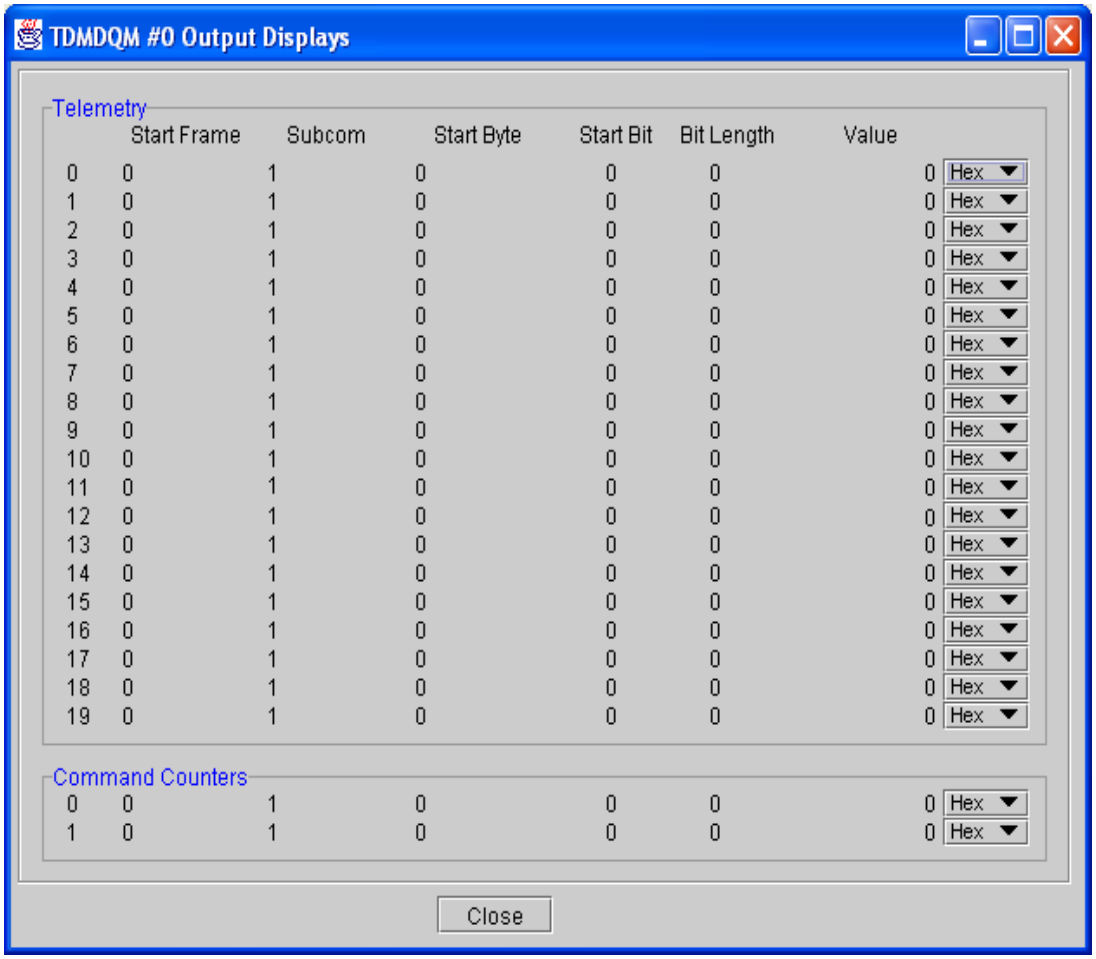


TDM DQM Status Displays



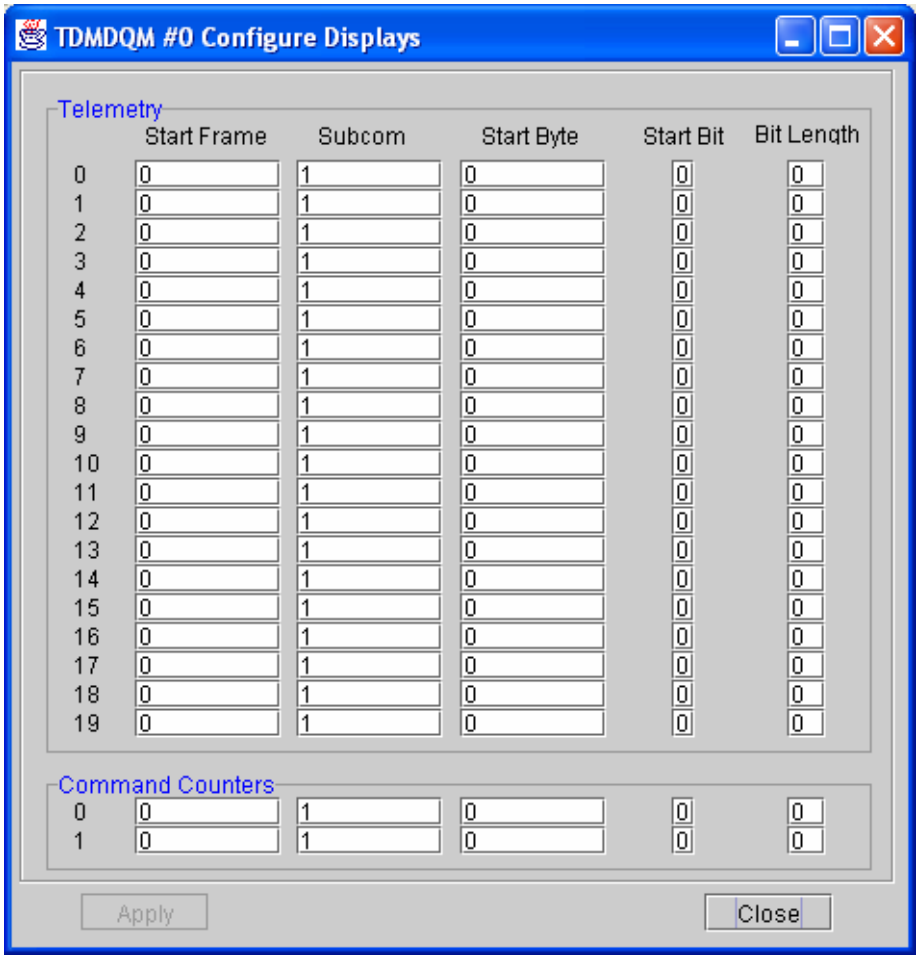
This display gives the status of the incoming data.

TDM DQM Status Displays



This windows displays the data that the user selected.

TDM DQM Status Displays

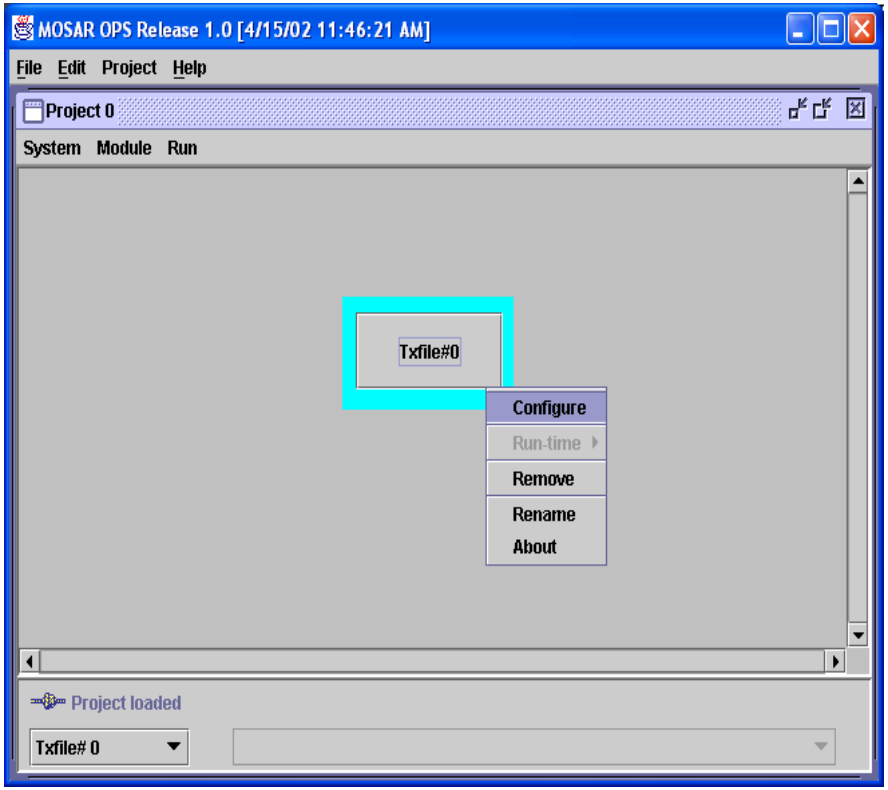


This window allows the user to reconfigure the display while the module is running

Data File Handling Modules

- These modules allow the user to store or retrieve data to a disk or CD.
  - TXFILE
  - LogModule

TXFILE



TXFILE has no Input Channels and 1 Output Channel.

This module can either be configured in Run Time or Non-Run Time

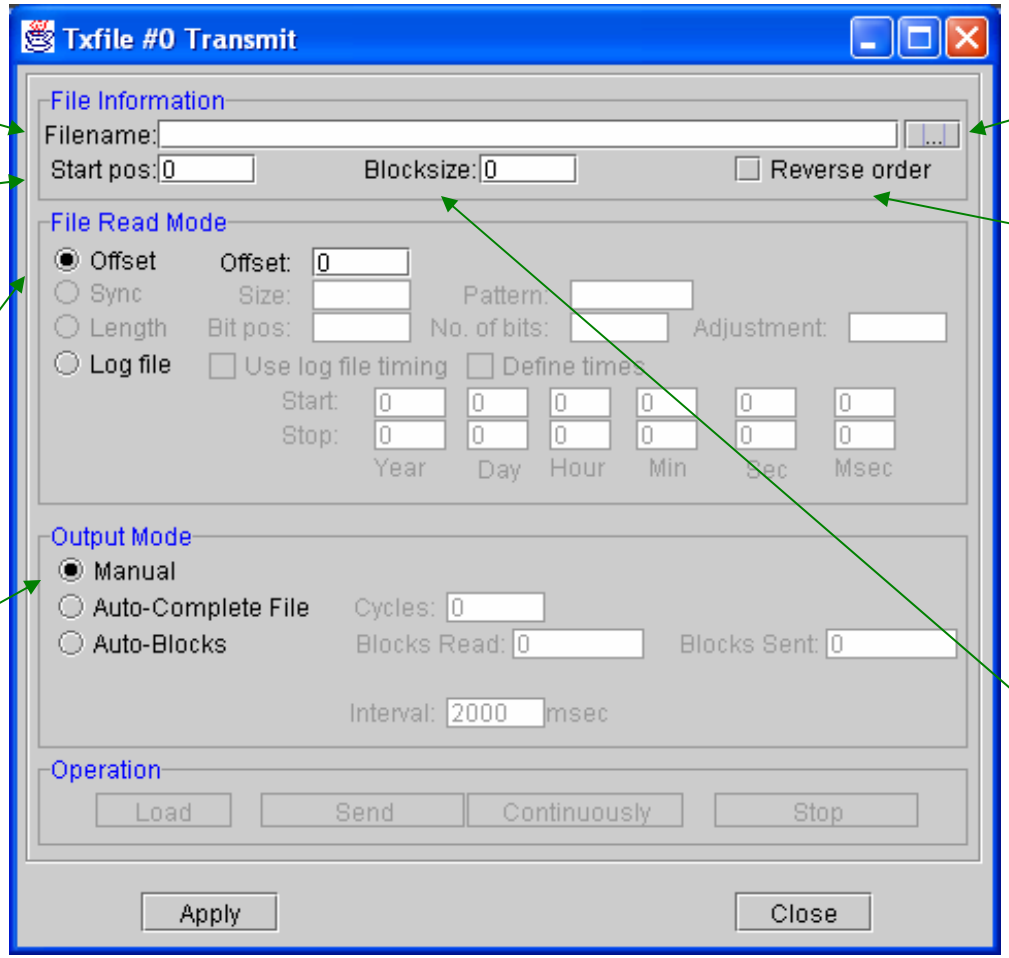
TXFILE Configuration Window

Allow the User to enter the name of the file to be played back

Position in the file to start playing in bytes

In Offset Mode the Offset is the number of bytes between block of data

In Manual Output Mode this module will transmit 1 block of data every time send is clicked.



Opens the File Browser Window.

Creates a file on the hard drive with the same name as the selected file with a .RSV extension. This essentially creates a reverse playback.

Enter the size of the data block to be played back

TXFILE Configuration Window

If the file was recorded using the logmodule with logheader selected, select this. It is not required to enter the Blocksize or Offset as this information is supplied in the logheader.

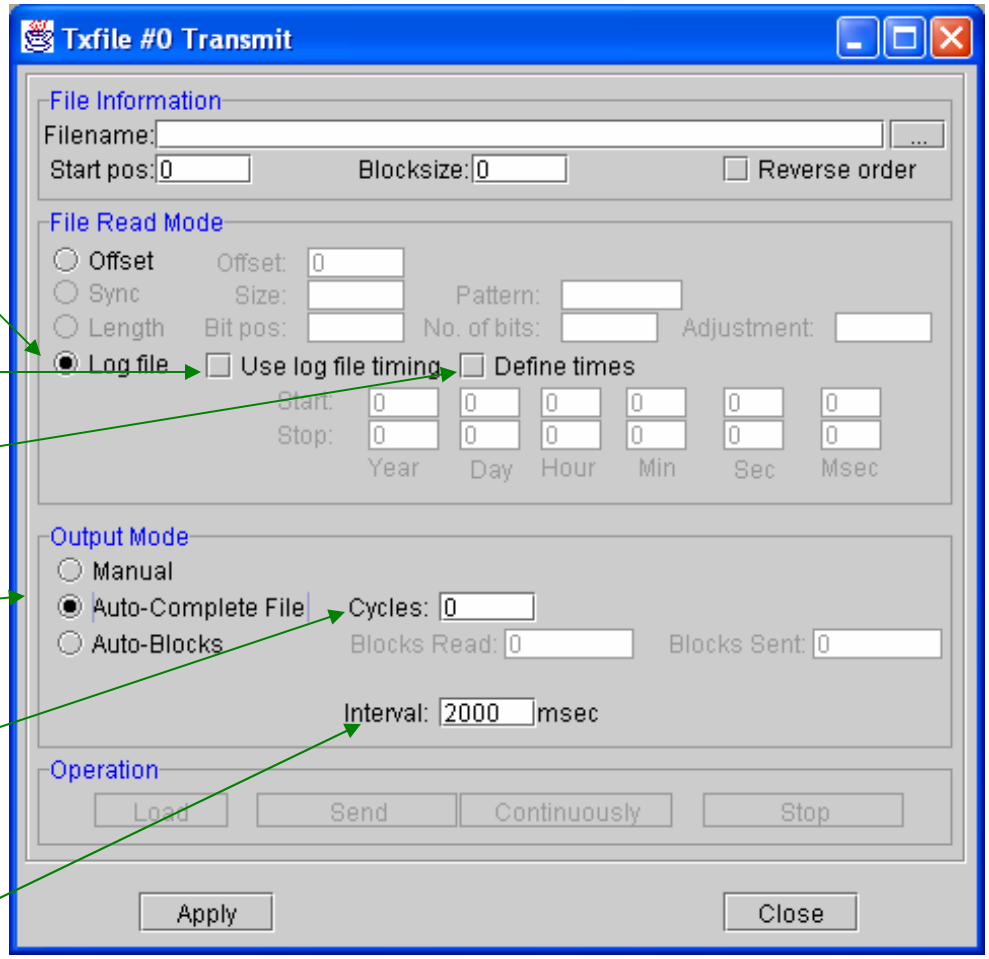
Selecting this will read the time in the logheader and transmit the blocks at the appropriate rate.

Selecting Define Times allows the user to play back a portion of the file based on the times in the logheader.

In this mode the module will transmit the entire file.

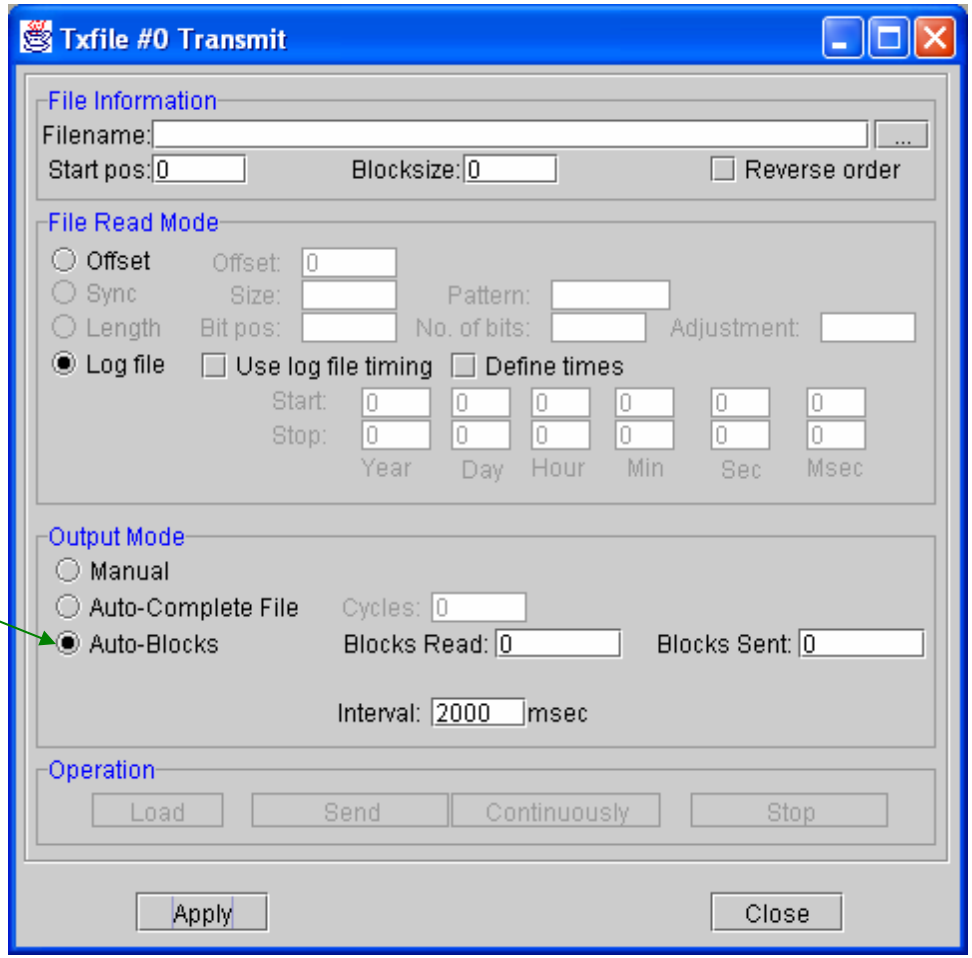
This allows the user to enter the number of times to play the file. If 0 is entered the file will play until stopped

This specifies the interval between blocks. If this module is connected to an AVTEC Serial Output or Serial Output module, this is not used.



TXFILE Configuration Window

This mode allows the user to specify the number of blocks to read and the number of blocks to send. For Example, this is useful if you would like to transmit the a single block 5 times or 5 block 20 times. The rate that the blocks are transmitted is controlled by either the specified interval entry or by a connected module



Transmitting NASCOM Blocks from a File

A file of block data has been selected.

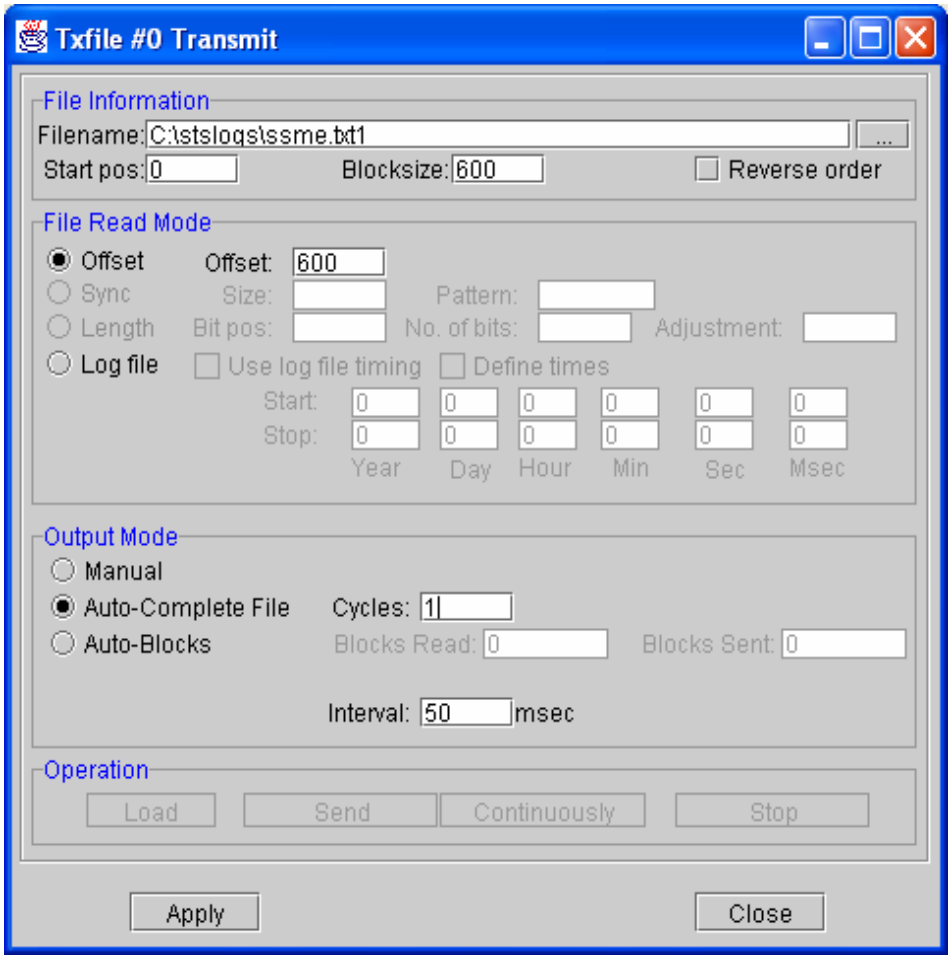
The block size is 600 bytes.

The Offset 600 bytes.

The module is configured for Auto-Complete File Mode

The file will play once and then stop.

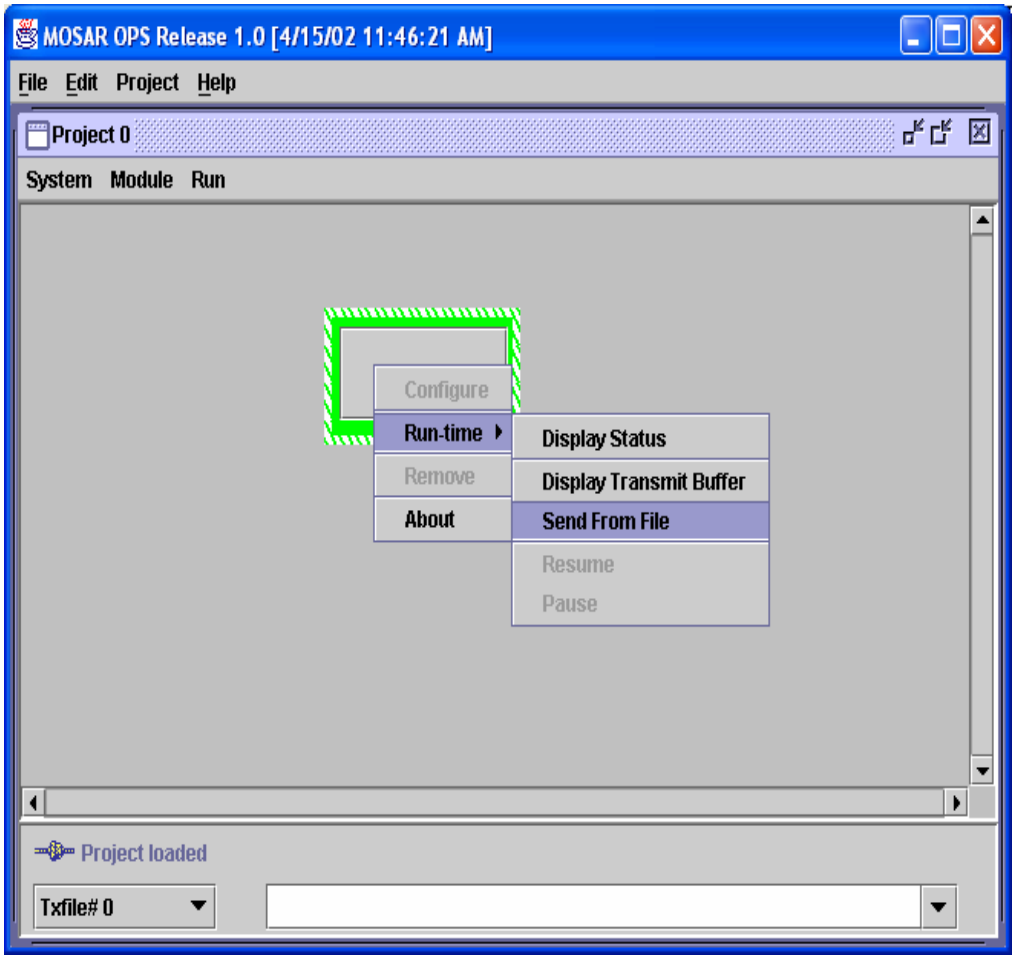
Each block will be sent 50 msec after the previous block.



TXFILE Run Time Display

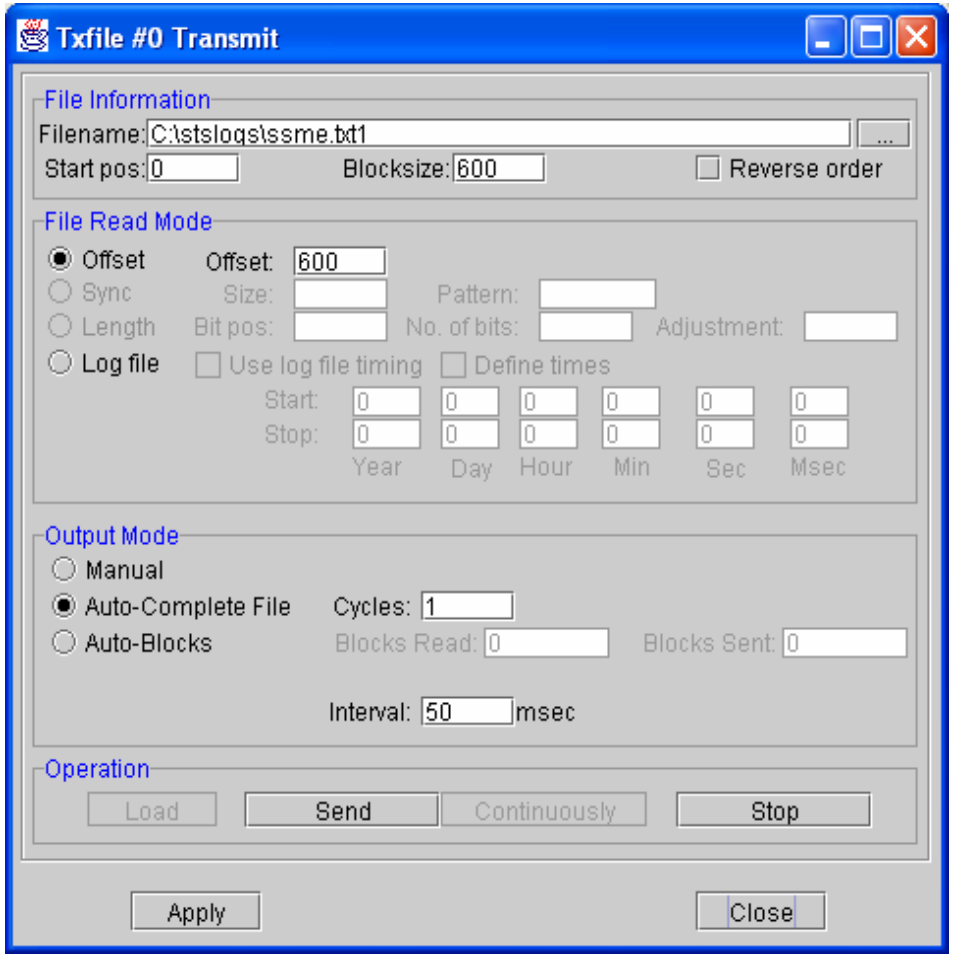
The user is offered the standard selections.

Use the Send From File to open the transmit window.

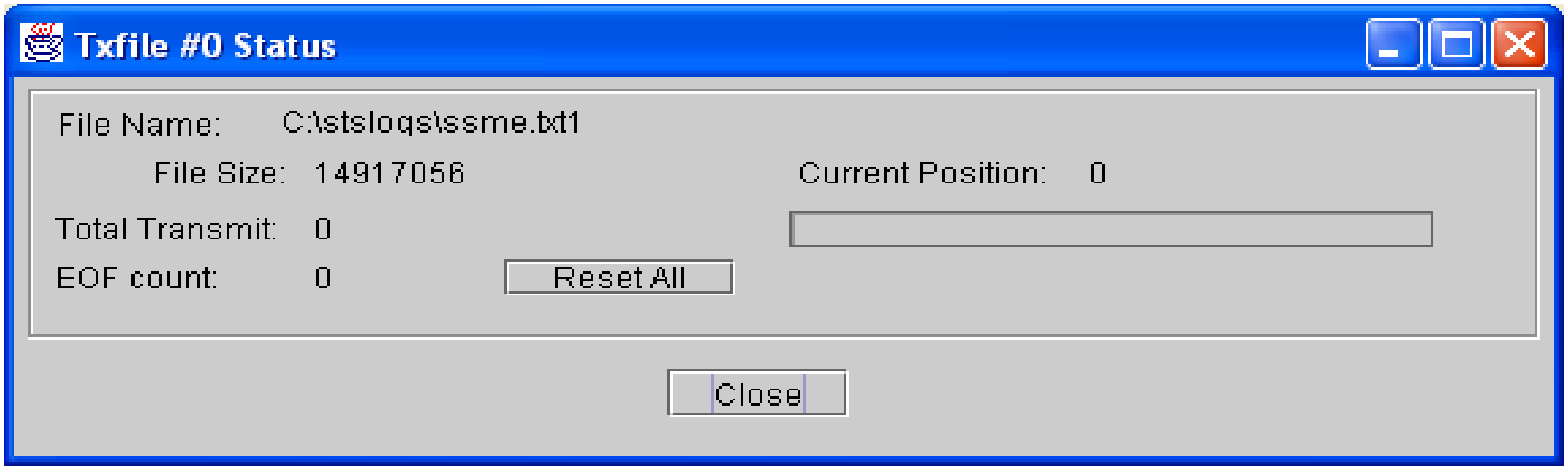


TXFILE- Send from File Display

This display is the same window used to configure the module. The difference is now the Send and Stop Buttons are now accessible. For our example, pressing the Send button will start the file playing.



TXFILE – Status Display



This display provides the user the following information

File Name Selected

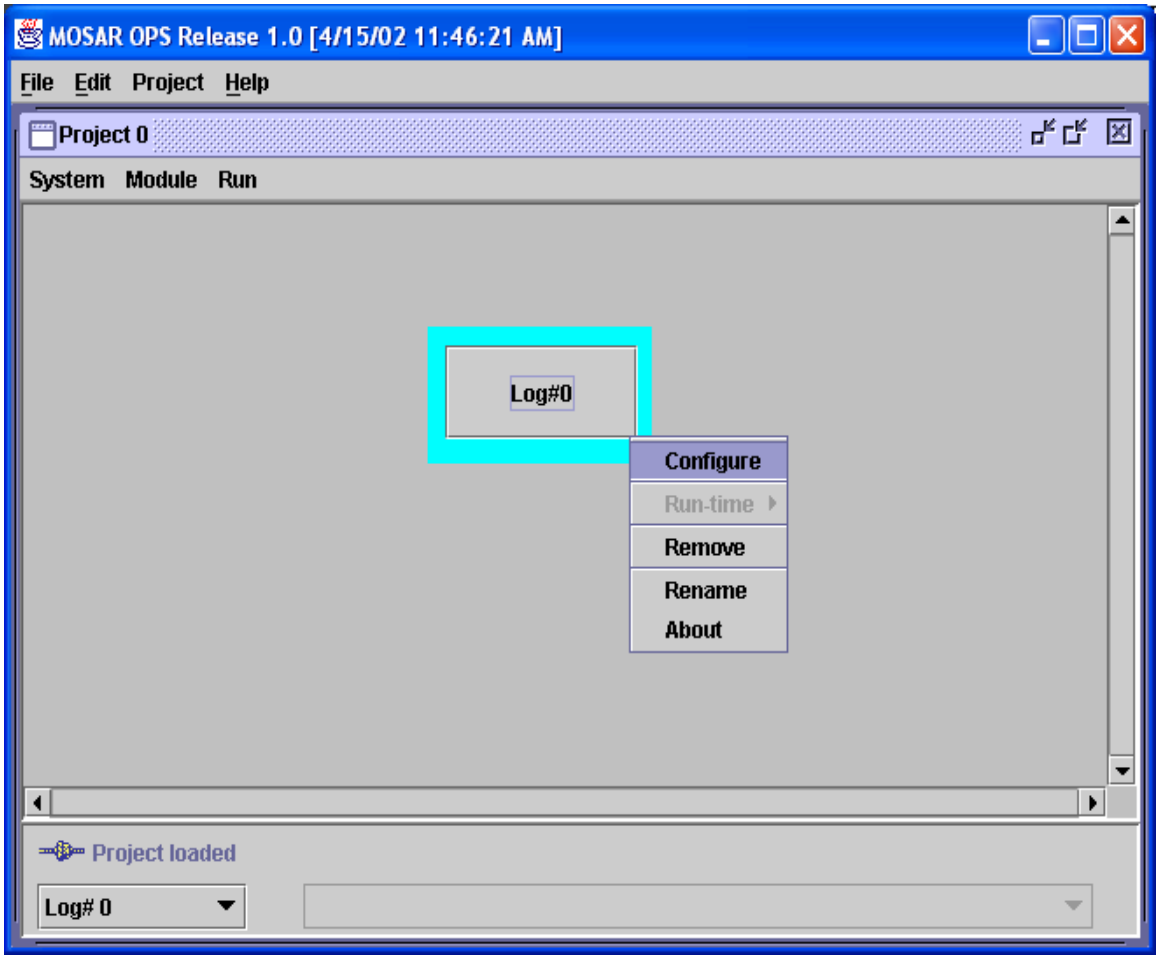
File Size

Total Transmit (Number of bytes transmitted)

EOF Count (Number of times the file has reached the end and started again)

Current Position

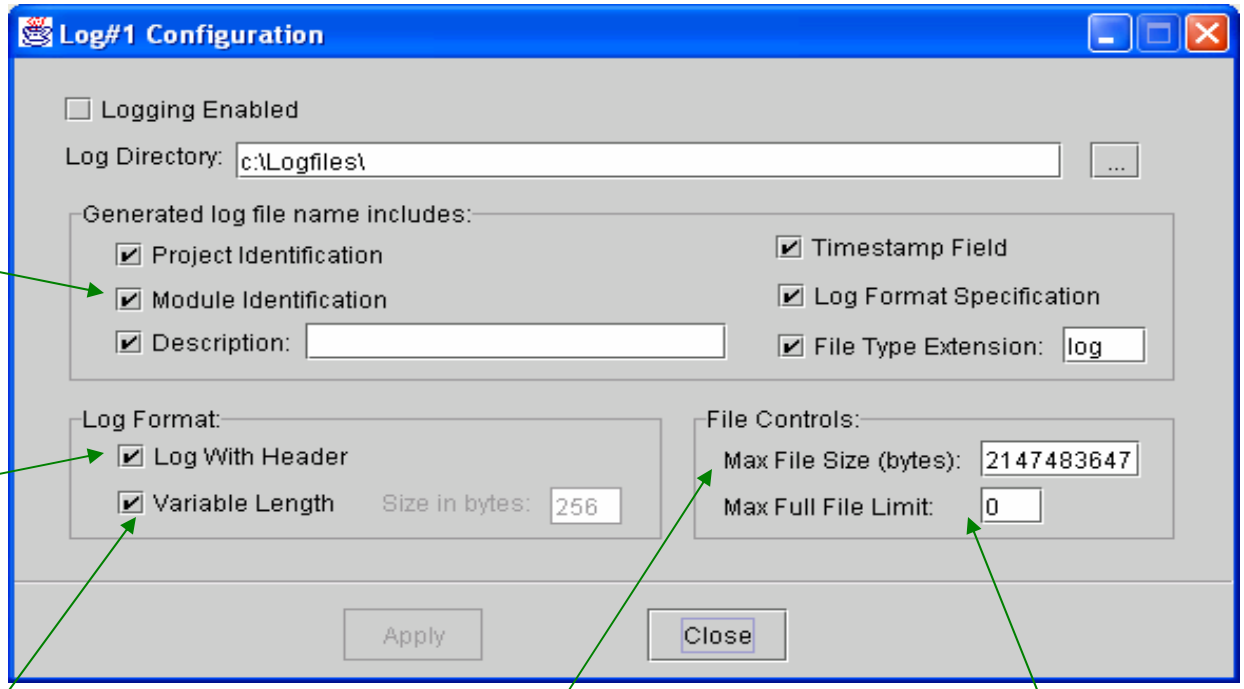
Log Module



Log Module is a can be configured in either mode

It has 1 Input Channel and no Output Channels.

Log Module Configuration Display



Allows the user to enter the name of the file to be logged. This is explained on the next slide.

Applies a header to the data that has block size and time. This is very useful when using Txfile to play the data back.

Allows for inputs of varying block lengths. This is the preferred method of operation

Allows the user to specify the maximum size of file to open for logging.

When Max File Size is reached, this field will control whether a new file will be opened

Log Module File Naming Convention

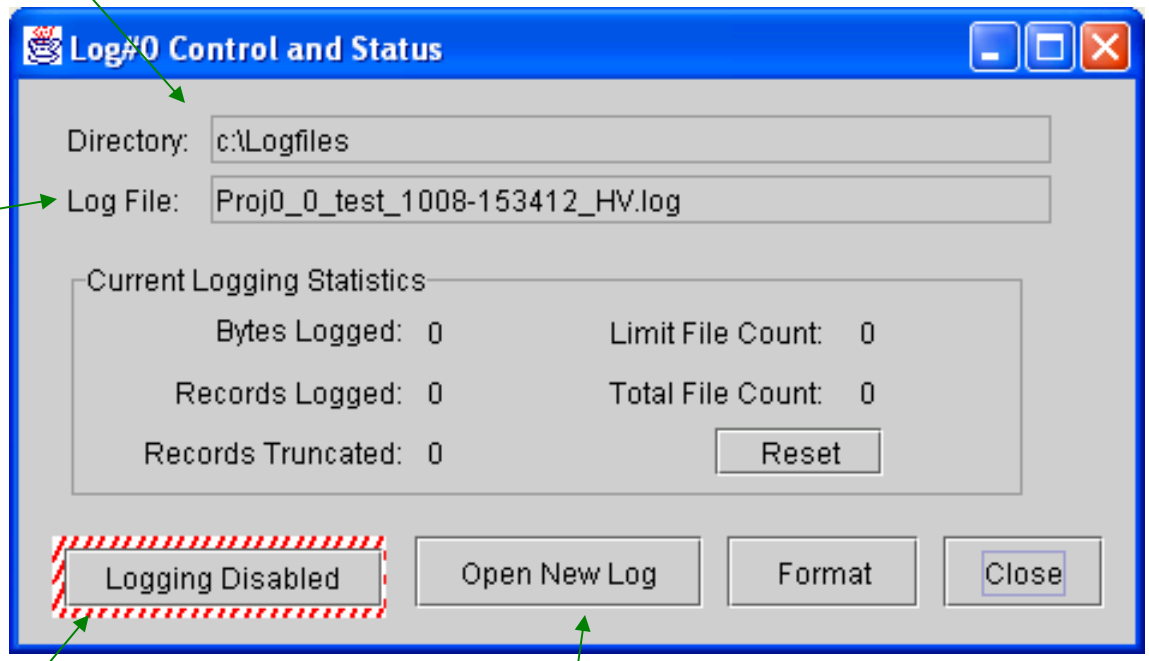
- Project Identification
  - This check box puts the project name as the first part of the file name.
- Module Identification
  - This Check box puts the module name in the second part of the file name.
- Description
  - This check box allows the user to provide a text entry to be inserted into the file name
- Time Stamp Field
  - This check box allows the user to add the system time to the file name
- Log File Specification
  - This check box add information on how the file was made. It allows the user to determine whether the Log Header and Variable length were used during the logging of the data.
- File Type Extension
  - This should either be **.log** or **.bin**.

Log Module Status Display

Location of the directory of the Log File

Log File Name

Note: See previous slide for naming conventions.



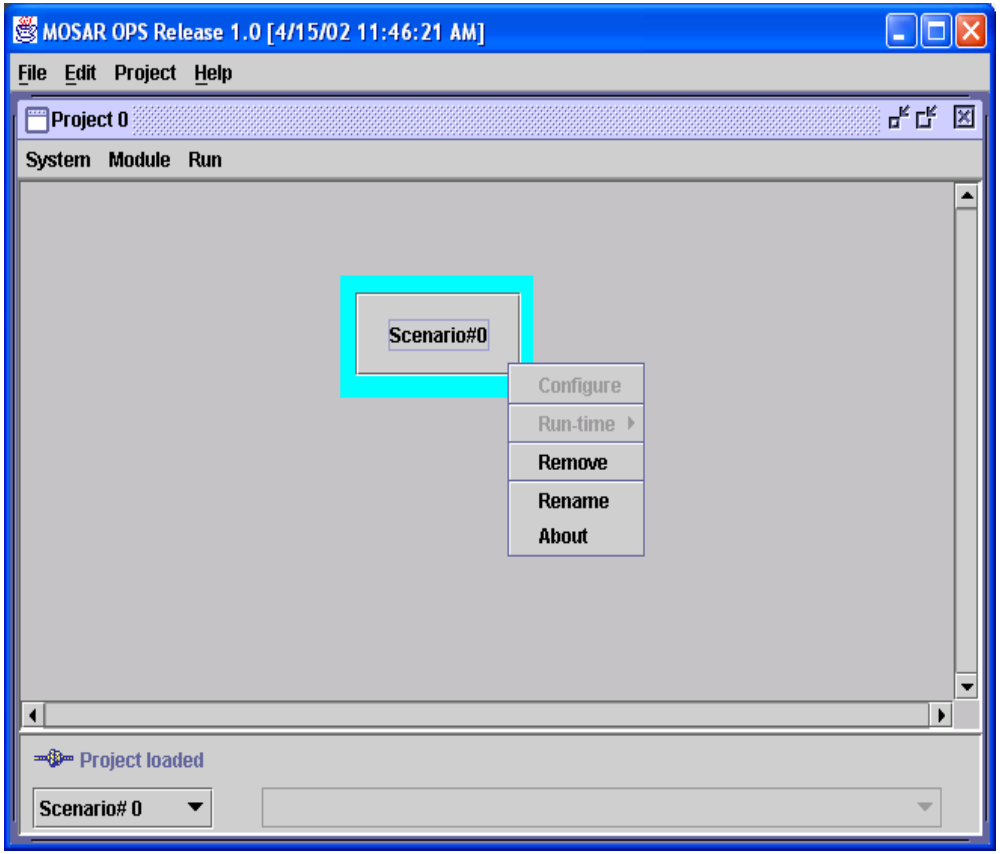
Logging is disabled when the project is started. This border will turn green when the module is logging data. Pressing thi will enable logging.

Pressing this will close the open file and create a new file with the time stamp updated.

Data Manipulation Modules

- Scenario
- TDMDemux
- TlmMod
- Wrapper
- Test Module
- JSC CMD Encode

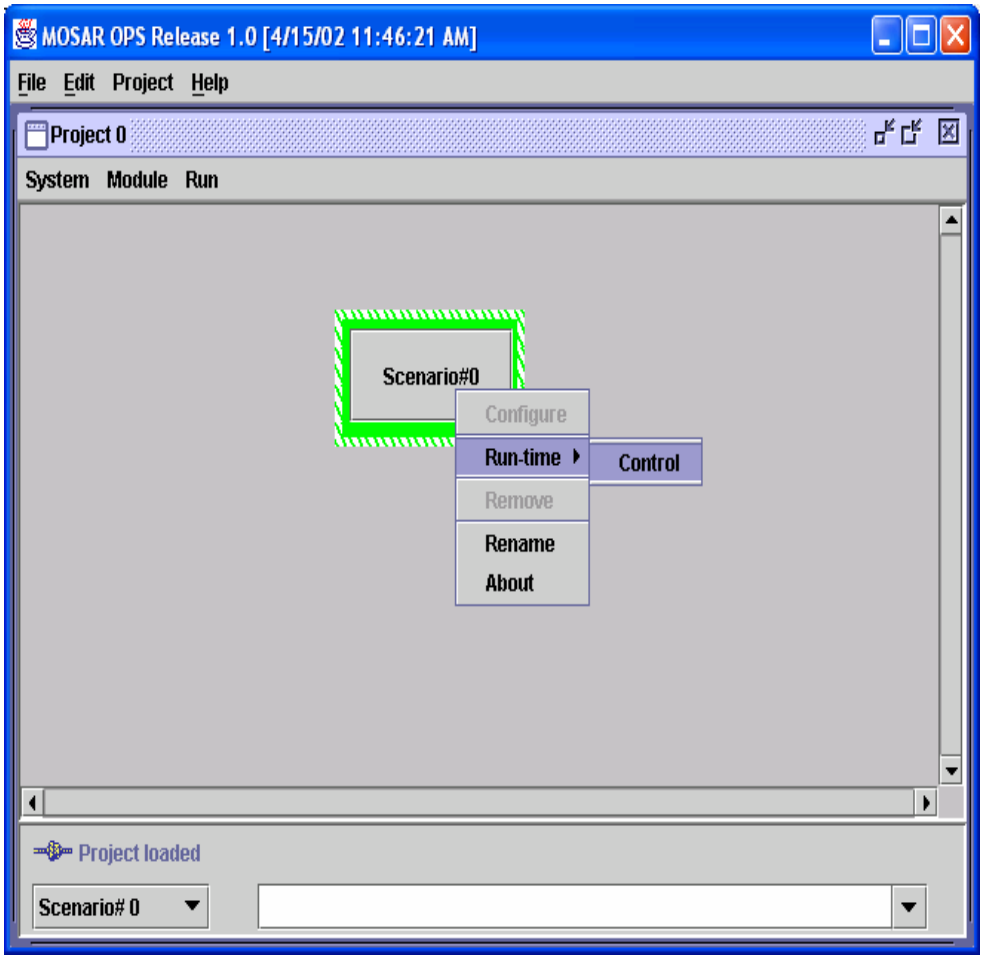
Scenario



The Scenario Module has no Input Channels and 1 Output Channel.

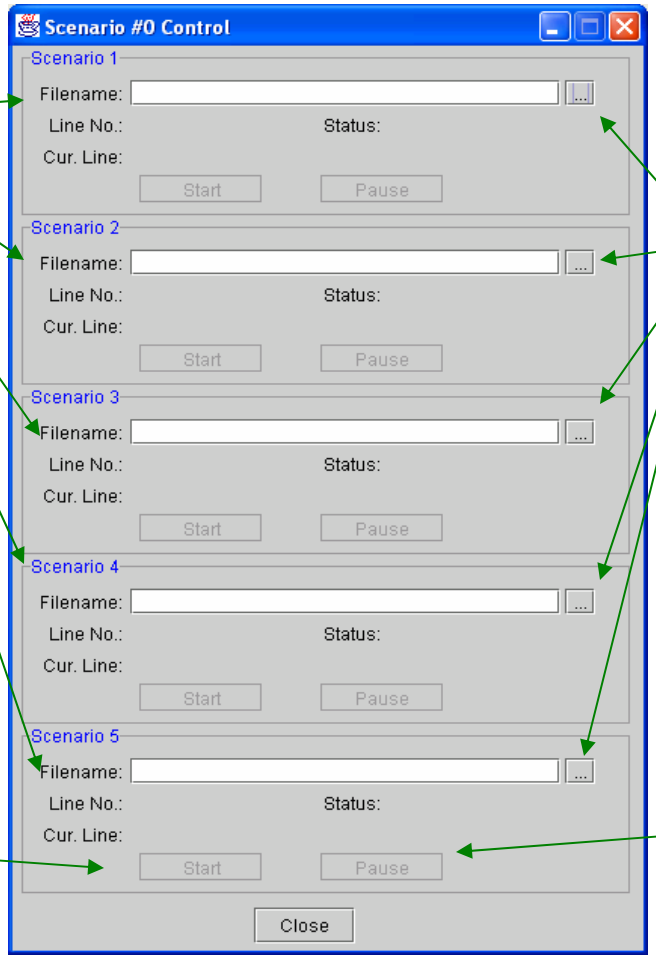
It is a Run-Time Configurable Module.

Scenario Run Time Display



Scenario Control Display

Enter the Name of the Scenario File

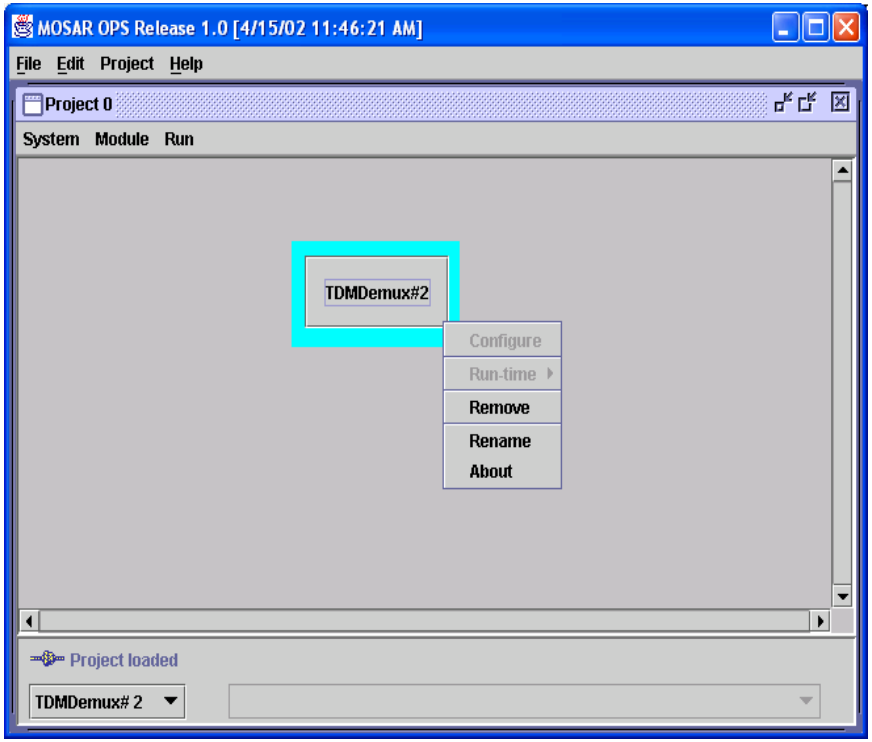


Access the Standard File Browser

When a file name is selected the ***Start*** button will be enabled

When the Scenario is running the ***Pause*** button will be enabled.

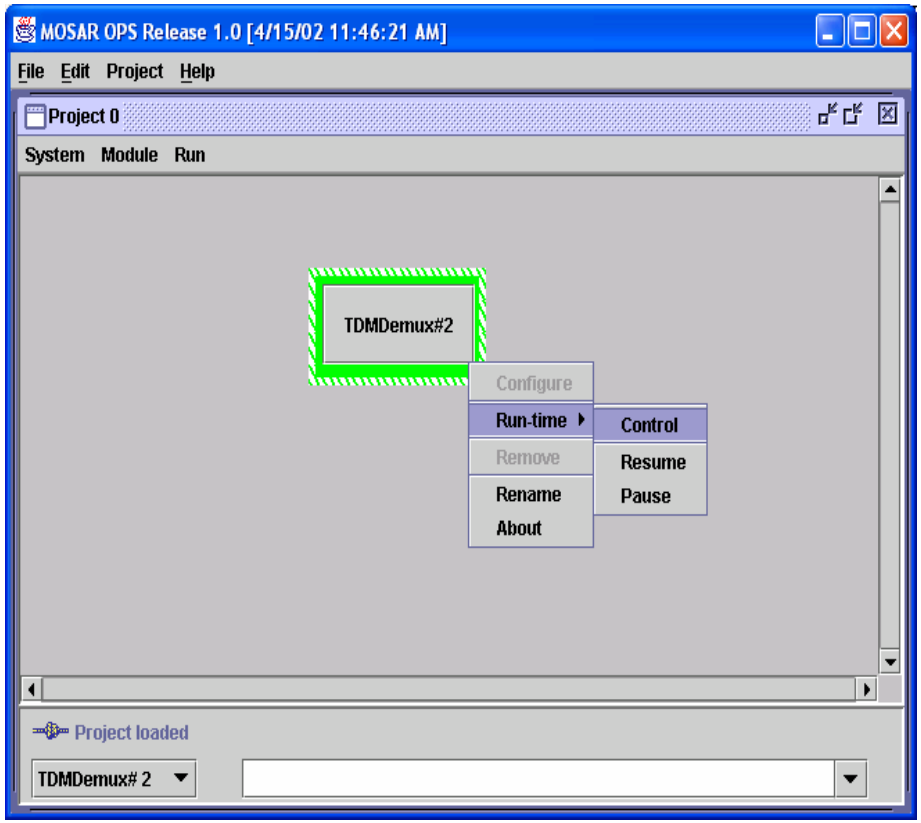
TDM Demux



TDMDemux has 1 input channel and 3 output channels.

This module is a Run Time configurable module

TDM Demux Run Time



Use the down menus to open the control window. This also allows the user to start and atop the module.

TDM Demux Control Window

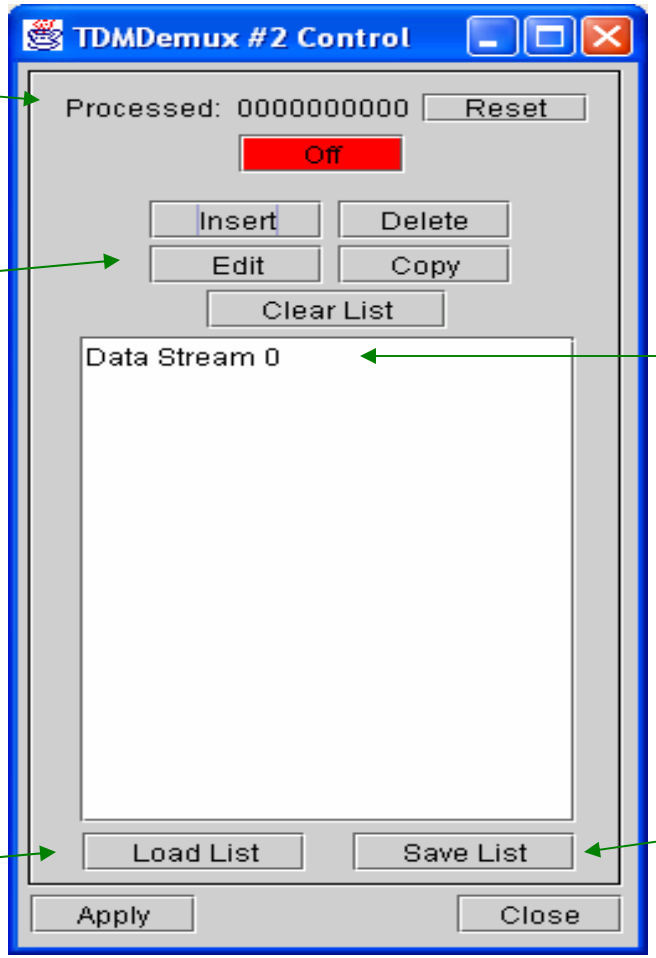
Displays the number of packets received

Use these buttons to Add, Edit, Delete, or Copy

When the Insert button is clicked This entry will appear.

Save a list of data

Load a list of previously saved items.

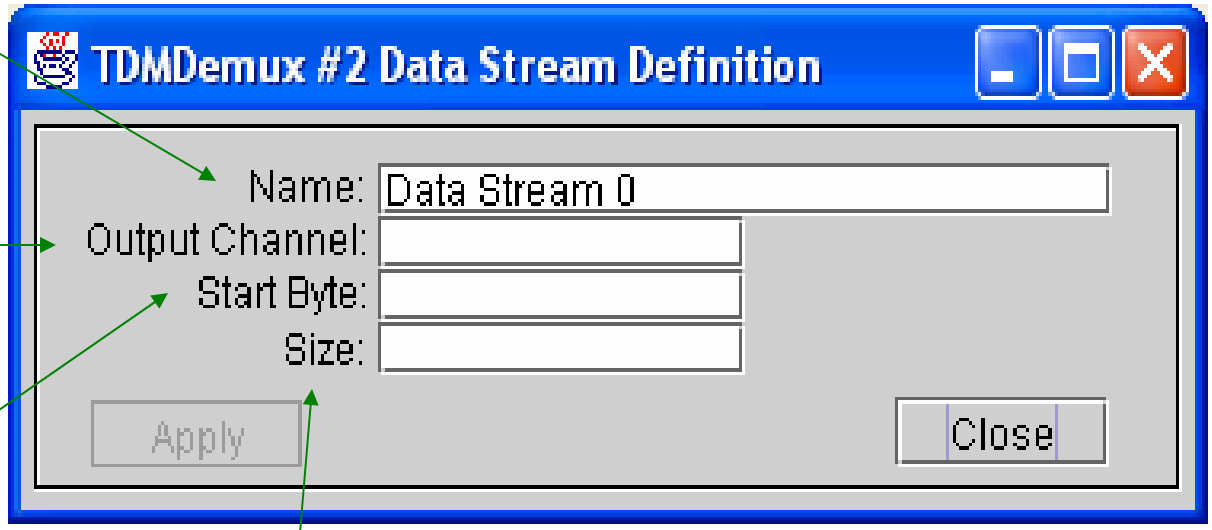


TDM Demux Data Stream Definition Display

Allows the user to provide a name to the stream

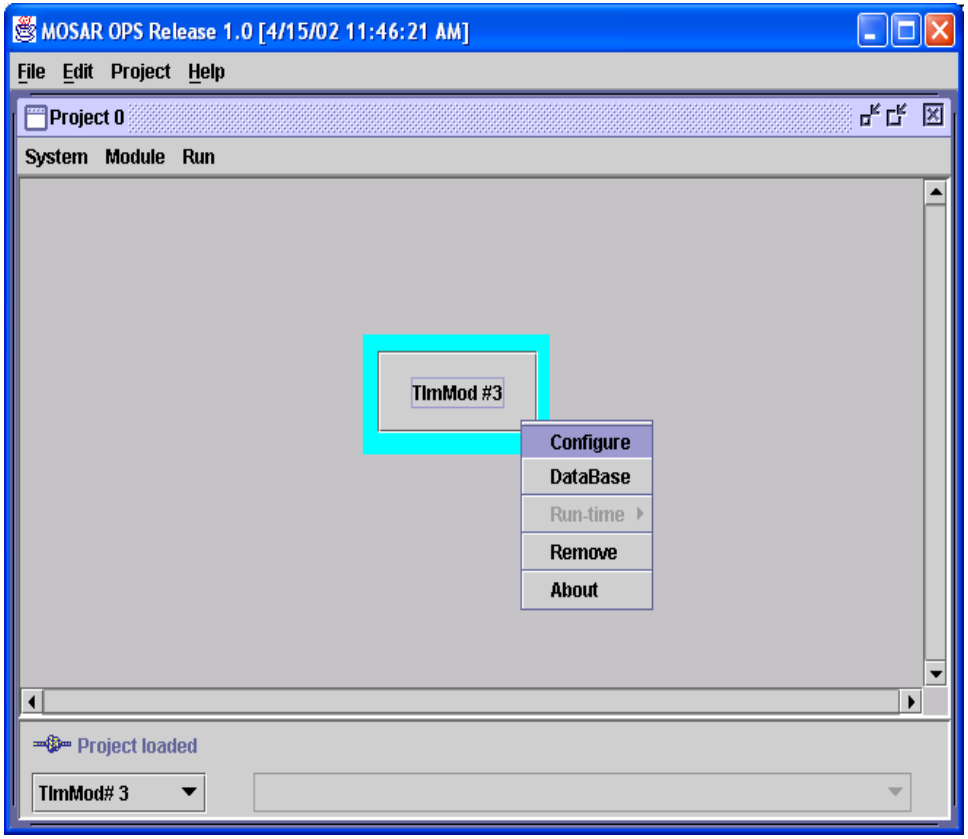
Specify where the data will be output. Channel 1, 2, or 3

Byte to start extracting. Note the buffer starts with byte 0.



Number of bytes to extract.

TLMMod



TLMMod has 1 Input Channel and no Output Channels.

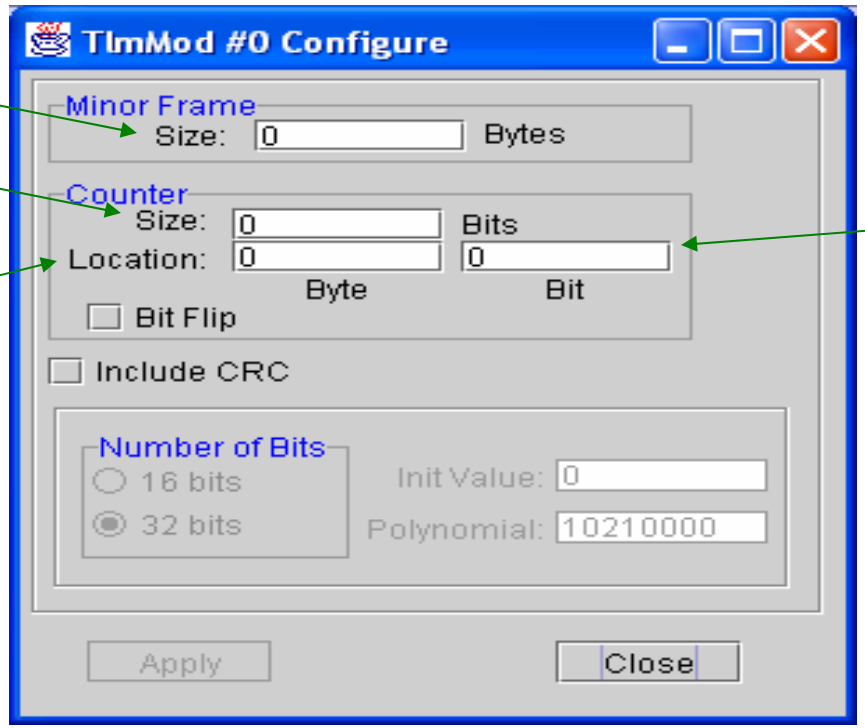
This module is a Non-Run Time configurable module.

TLMMOD Configuration Display

Enter the Frame Length in Bytes

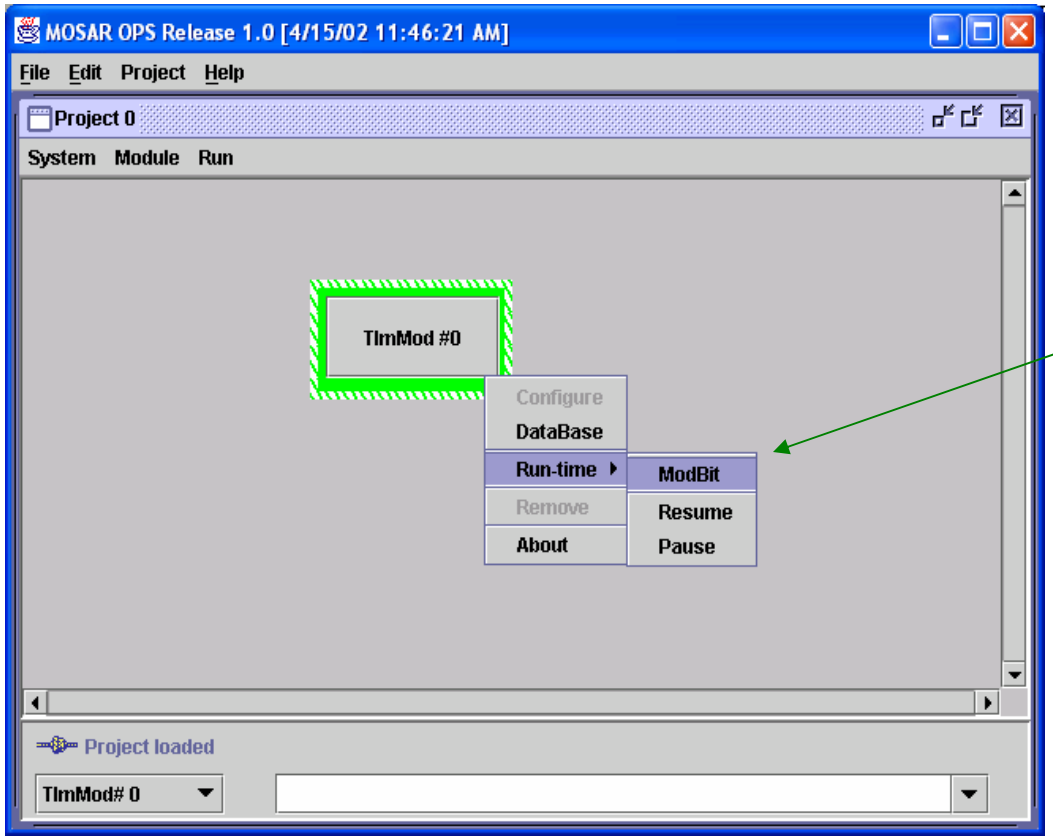
The counter size in bits

Counter location byte #. The first byte of the frame is 0.



Bit location to start at. The MSB is bit 0 the LSB is bit 7

TLMMOD Run Time



Using the drop down will allow the user to access the MODBIT window or Start Stop the module.

TLMMOD MODBIT Display

of frames between modification. For example 10 = every 10 frames

First Byte to modify in the frame

First bit to modify in the frame

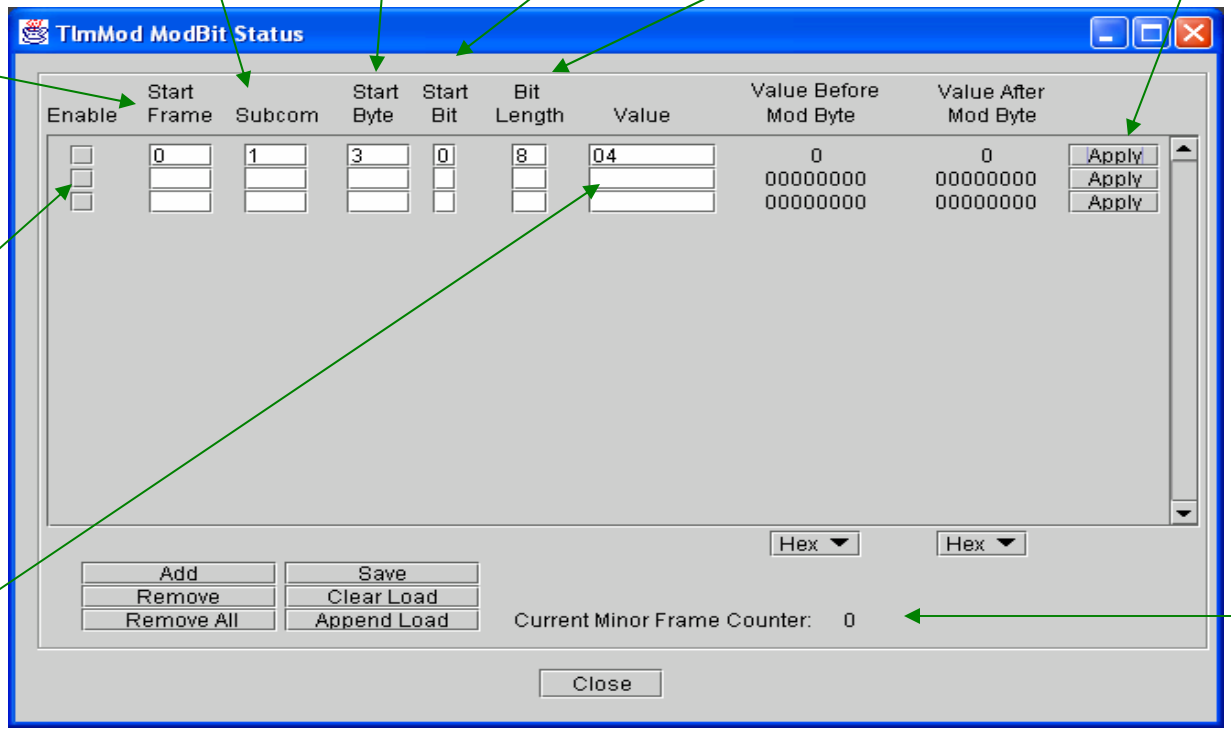
# of bits to change. Up to 32 bits

You must click apply for changes to be accepted

The first frame to modify

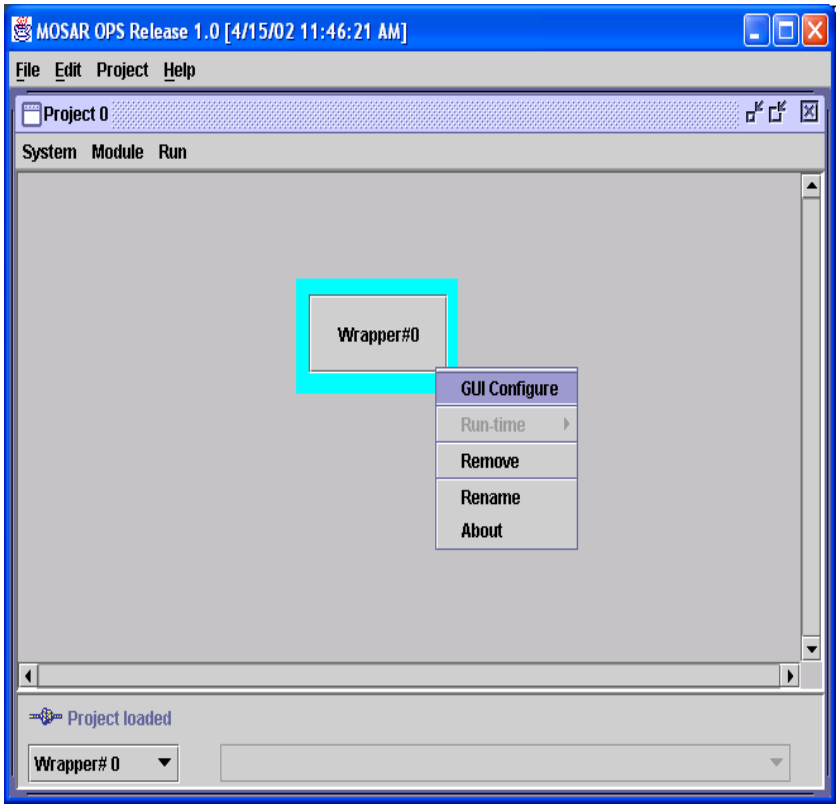
Checking this box enables the changes entered

New value to enter



Current minor frame being processed

Wrapper Module



The Wrapper Module has 1 Input Channel and 1 Output Channel.

It can be configured either during Run Time or Paused.

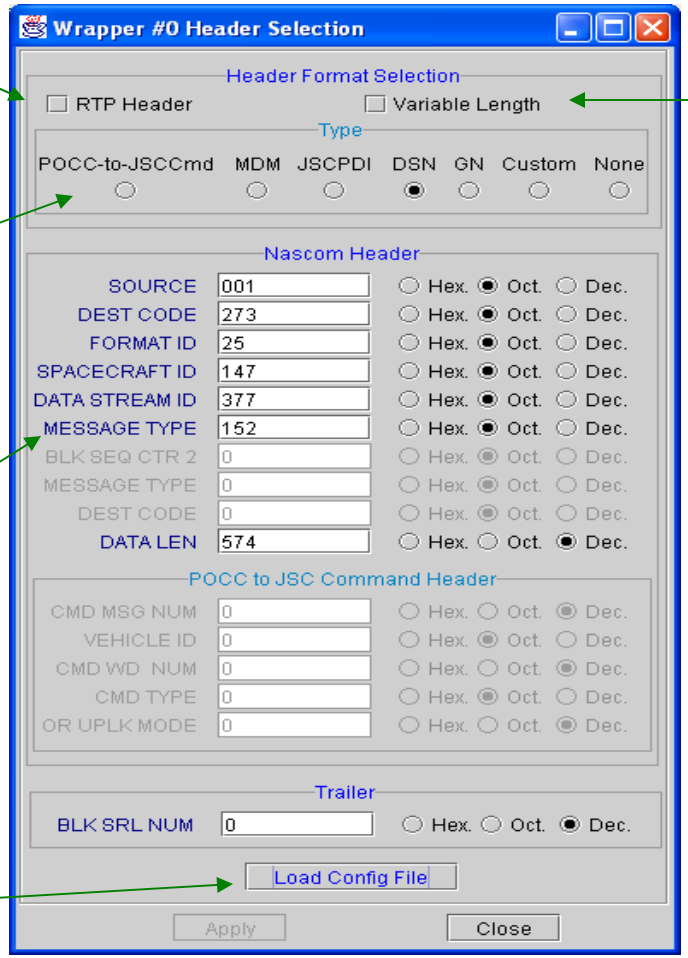
Wrapper GUI Configure

Add a RTP header to the block. This is used to insure data during IP transmissions

Select the Block Type

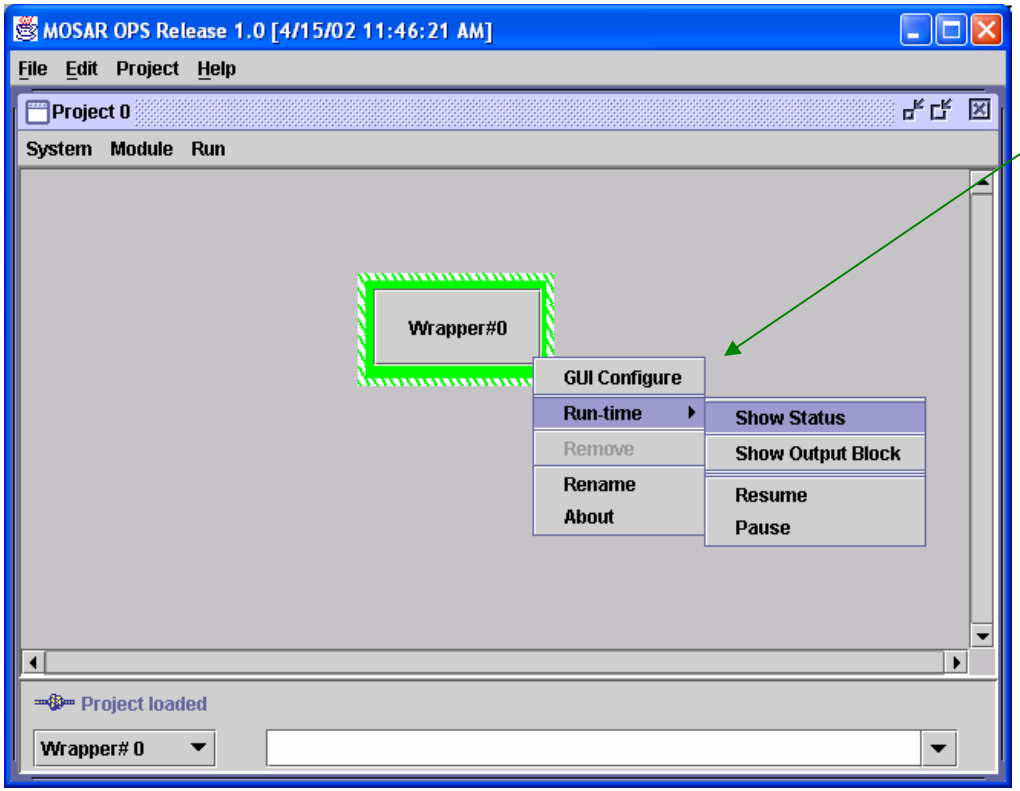
Specify the header information

Load a prebuilt header from the database.



Checking this box will place the incoming buffer of data into a block and transmit it immediately. If it is unchecked it will wait until it has enough data to equal the data length entry and then it will insert the data into a block and transmit it.

Wrapper Run Time



Access the GUI Configure while the module is running

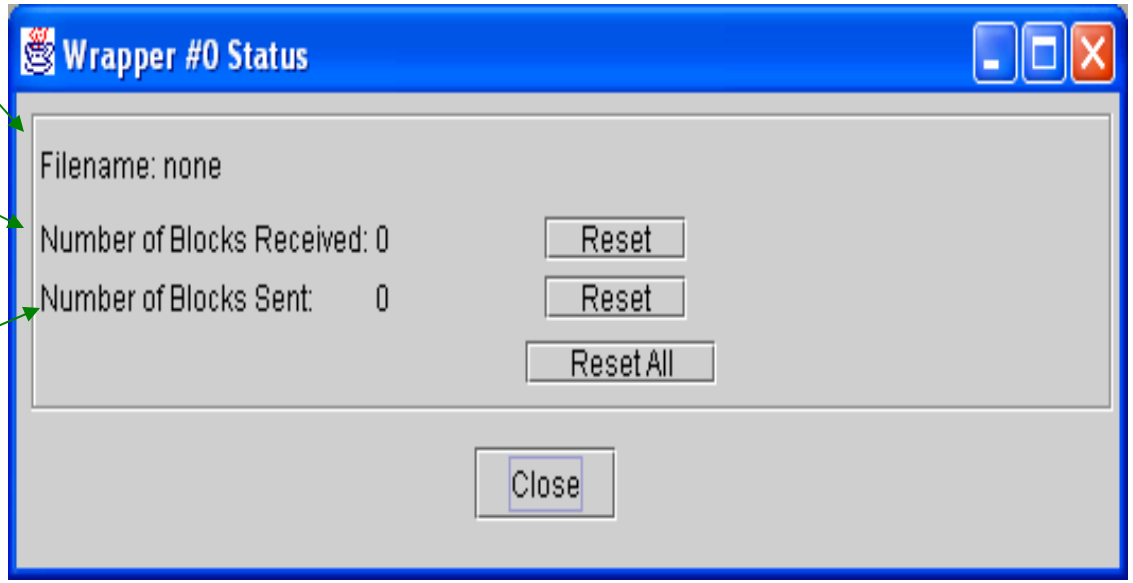
Accessing the drop down window allows the user to open the status display, the raw data display or Start or Stop the module.

Wrapper Status Display

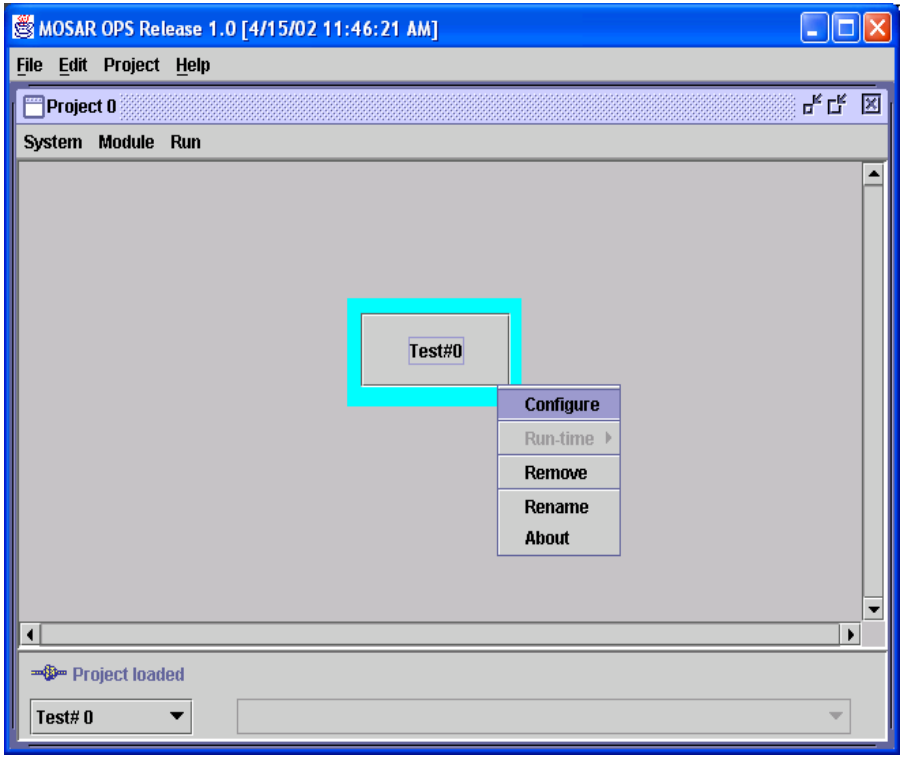
This will display the filename if a prebuilt header was used

Number of input buffers received.

Number of blocks transmitted



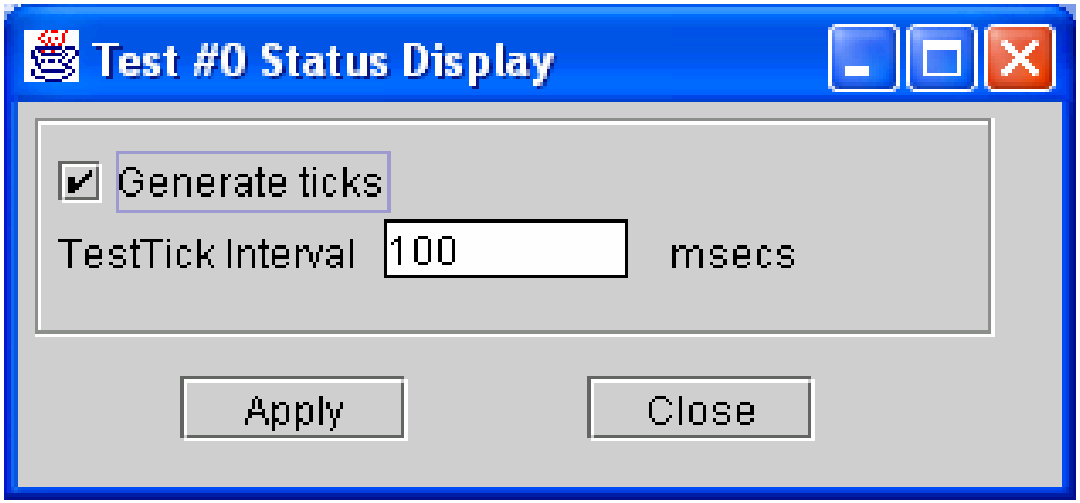
Test Module



The Test Module has 1 Input Channel and 1 Output Channel

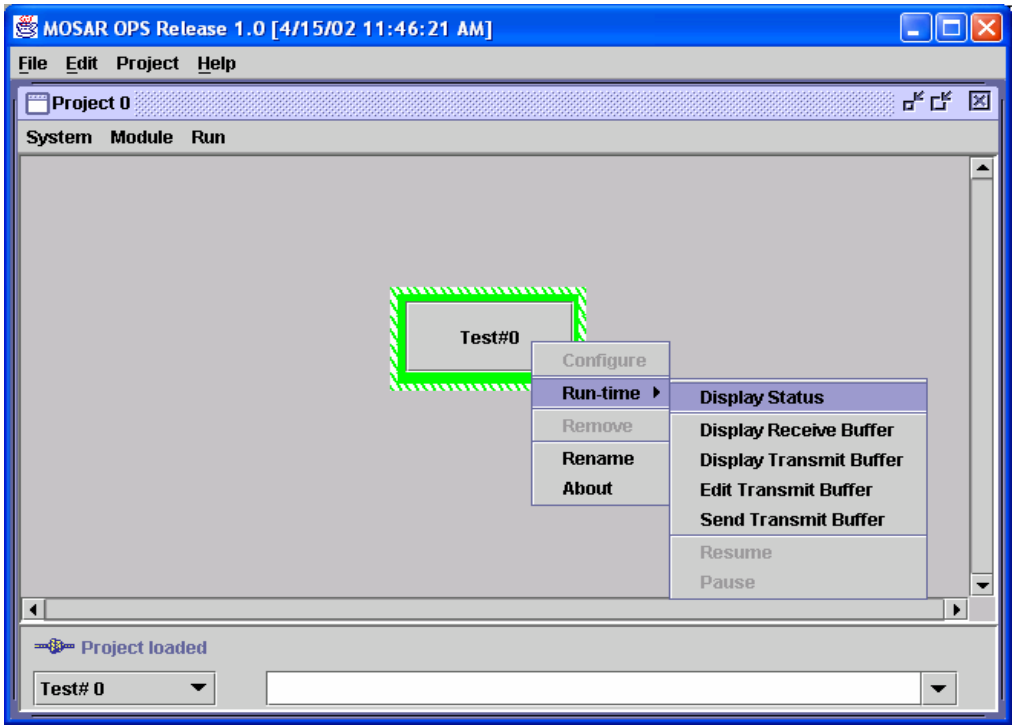
This module is a Non-Run Time configurable module.

Test Module Configuration



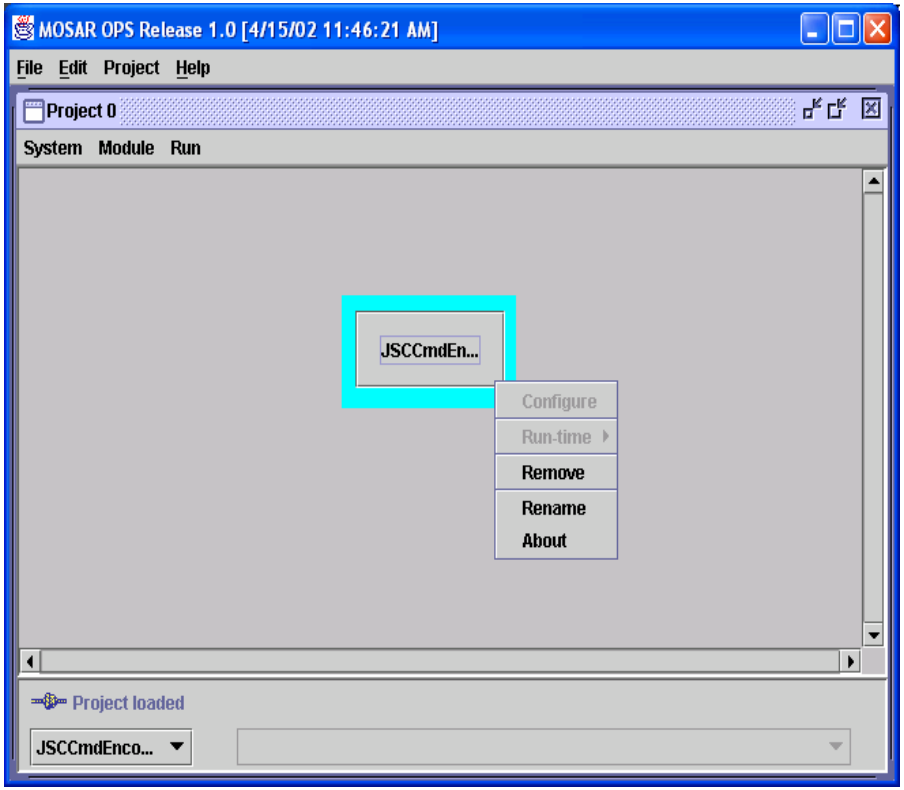
The Test Module generates “Ticks”. Ticks are software signals sent to the preceding module. They are most often used to tell a module when to send data. For example, Ticks can be used to tell TDMGen when to send data. The minimum interval is 10 msec.

Test Module Run Time



Accessing the drop down allows the user to display the status. It also allows the to display the raw buffers and edit some of the data.

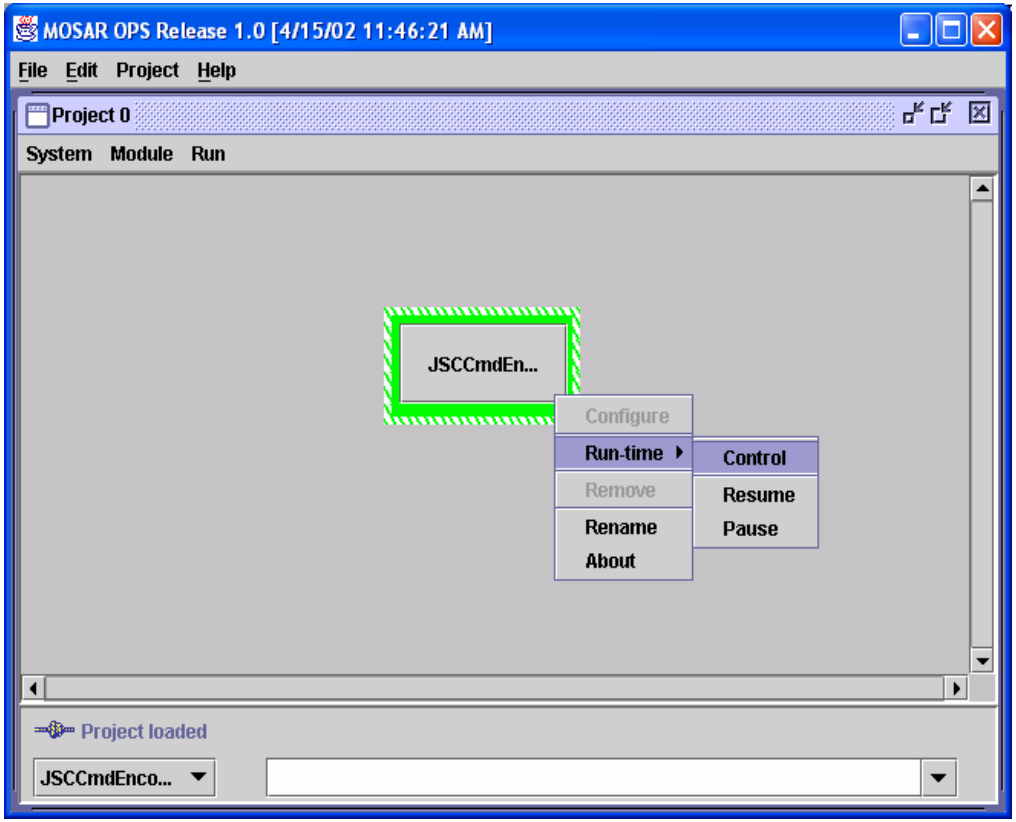
JSC CMD Encode



JSC CMD Encode has 1 Input Module and 1 Output Channel

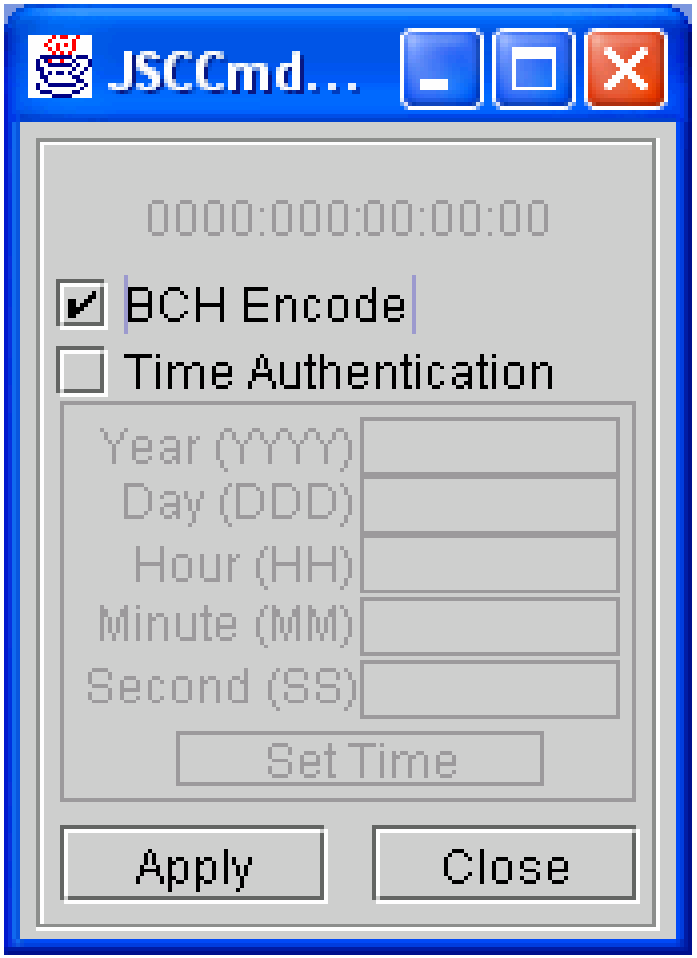
This module is a Run Time configurable module

JSC CMD Encode Run Time



The drop down allows the user to select the Control Display

JSC CMD Encode Control Window



If the BCH Encode is selected the module will encode the incoming buffer.

Checking the Time Authentication will encode the time into the shuttle command. The time used is entered in the windows and will start when the Set Time is Clicked.

Examples

- The following will show some typical uses and how to build a project to perform a specified task.

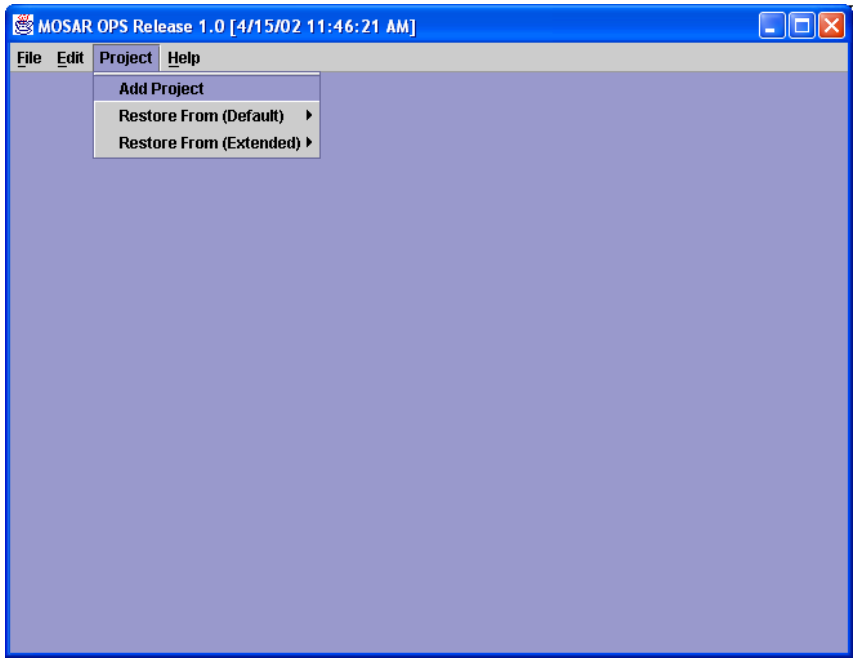
Example 1: Receiving Telemetry and Storing to a File

What is the source of the data?	What do I need to do to the data?	Where is the data going?
External Serial Telemetry Stream	Verify the Frame Integrity	Log to a File on the Hard Drive

Starting a New Project

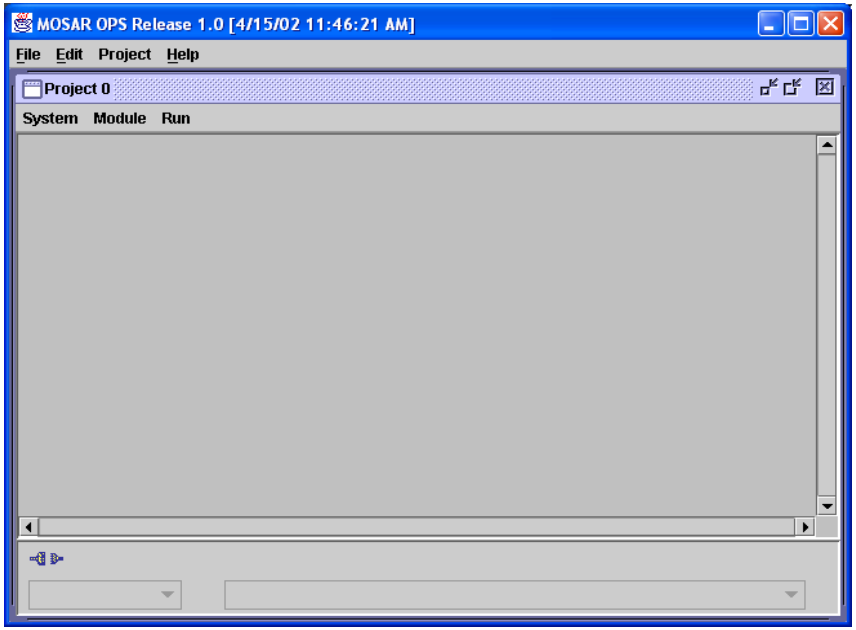
- Start the Server
- Start the Client
- You will see the Blank Client Window Open

Starting a New Project



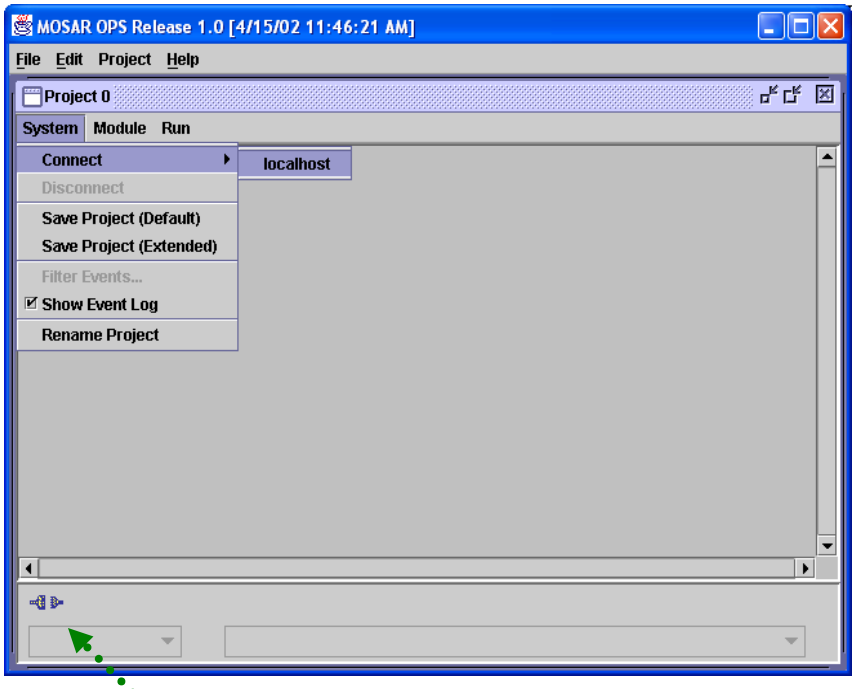
- Select Project
- Select Add Project

Starting a New Project



- The Project Window will be opened

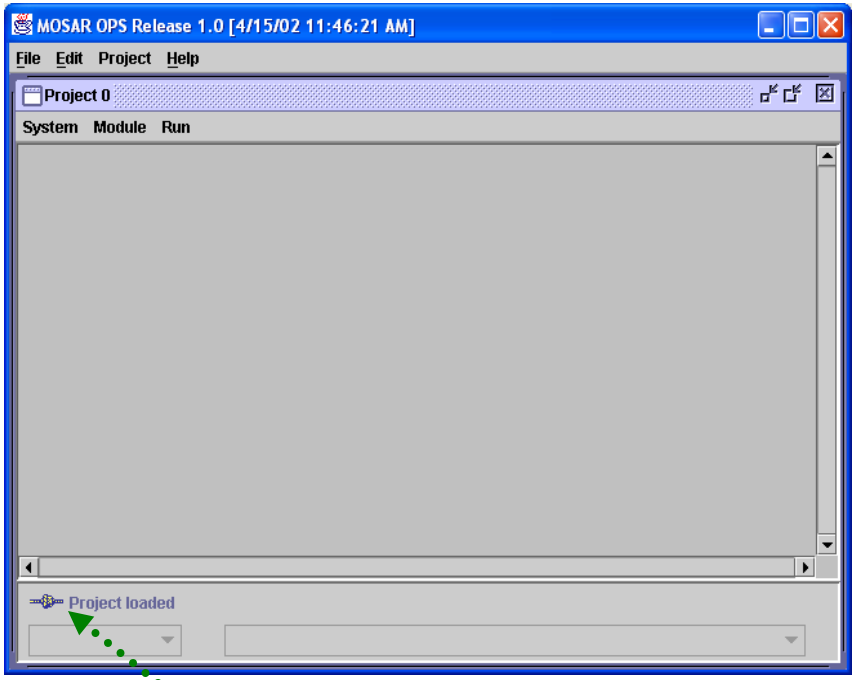
Starting a New Project



- Select System
- Select Connect
- Select Localhost

This symbol indicates the project has not be connected to the server

Starting a New Project



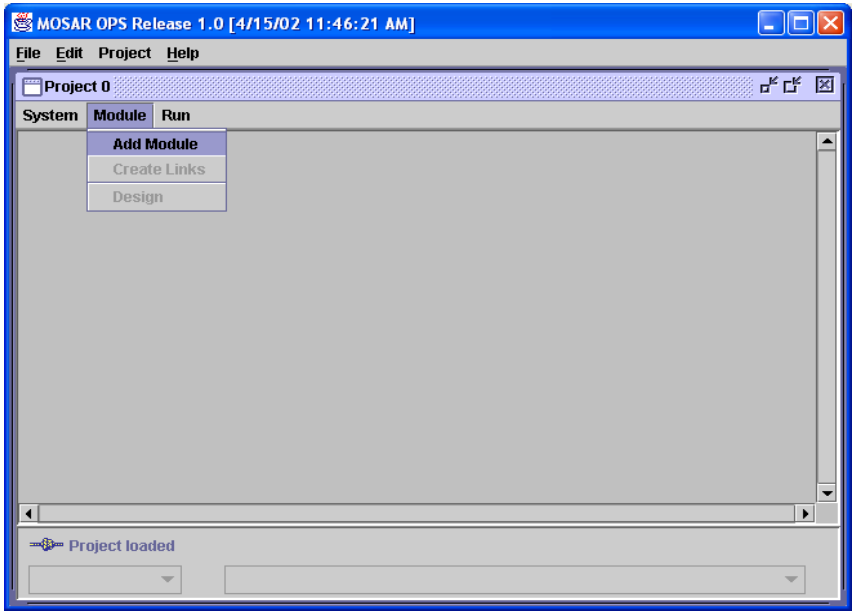
- At this point the project has been connected to the server and it is ready to add modules

This symbol indicates the project has been connected to the server

Adding Modules

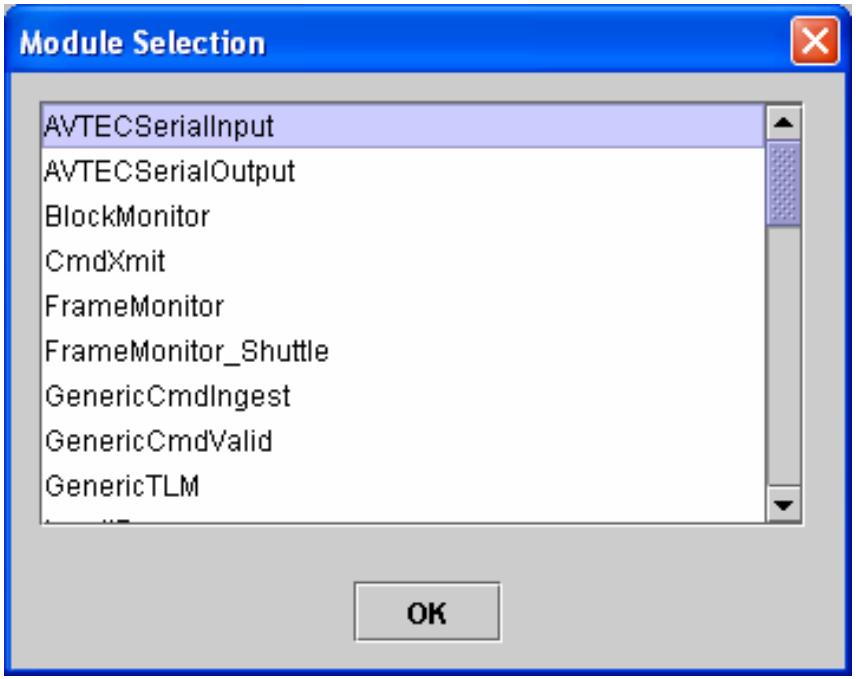
- From our example it has been determined that the following modules will be required
  - AVTEC Serial Input
  - Frame Monitor
  - LogModule

Adding Modules



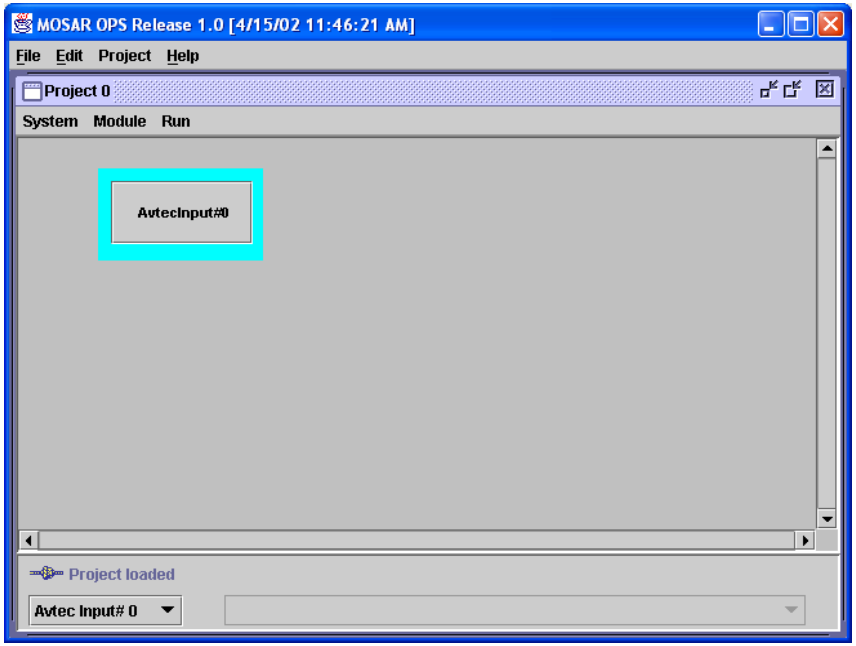
- Select Module
- Select Add Module

Adding Modules



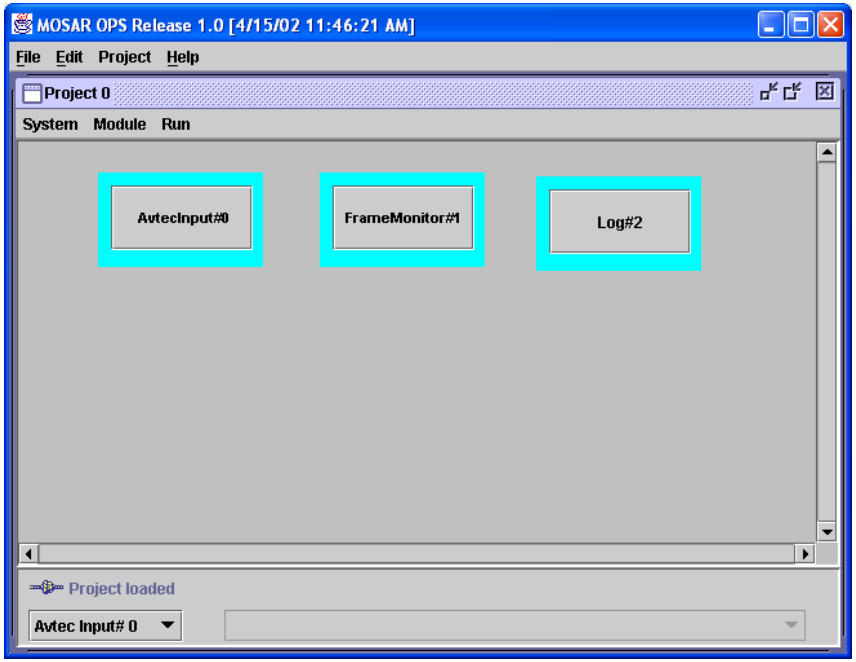
- The module selection window will open
- Scroll down to the desired module
- Select the module and click on OK
- The Module Selection window will close

Adding Modules



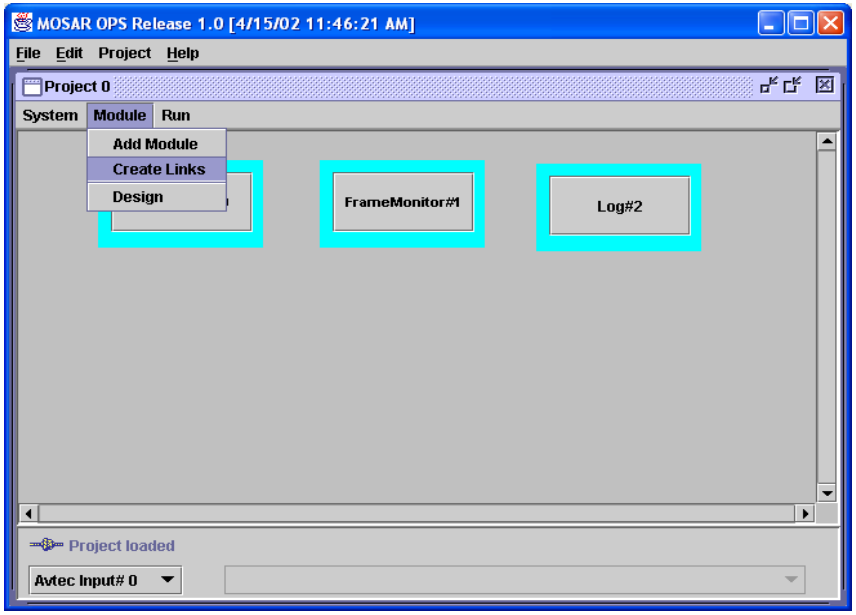
- Move the curser to where on the project you want to place the module
- Left click and the module will appear on the project

Adding Modules



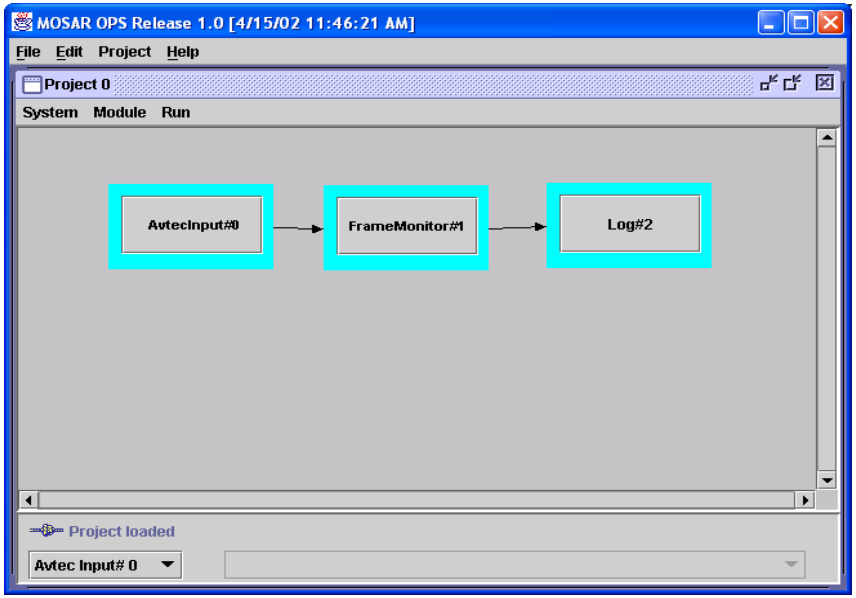
- Add the Frame Monitor and LogModule using the same procedures

Connecting Modules



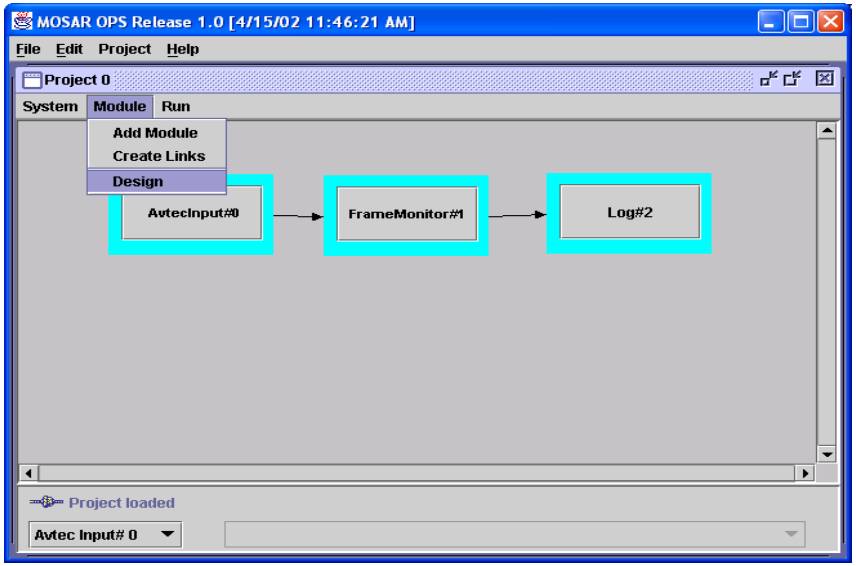
- Select Module
- Select Create Links

Connecting Modules



- Move curser to module you would like to connect from
- Click and move the curser to the module you would like to send the data to
- Click and an arrow head will appear indicating that the connection has been made

Connecting Modules



- When you have finished connecting the modules, Select Module and select Design
- This will take you out of the Create Links mode

Configuring the Modules

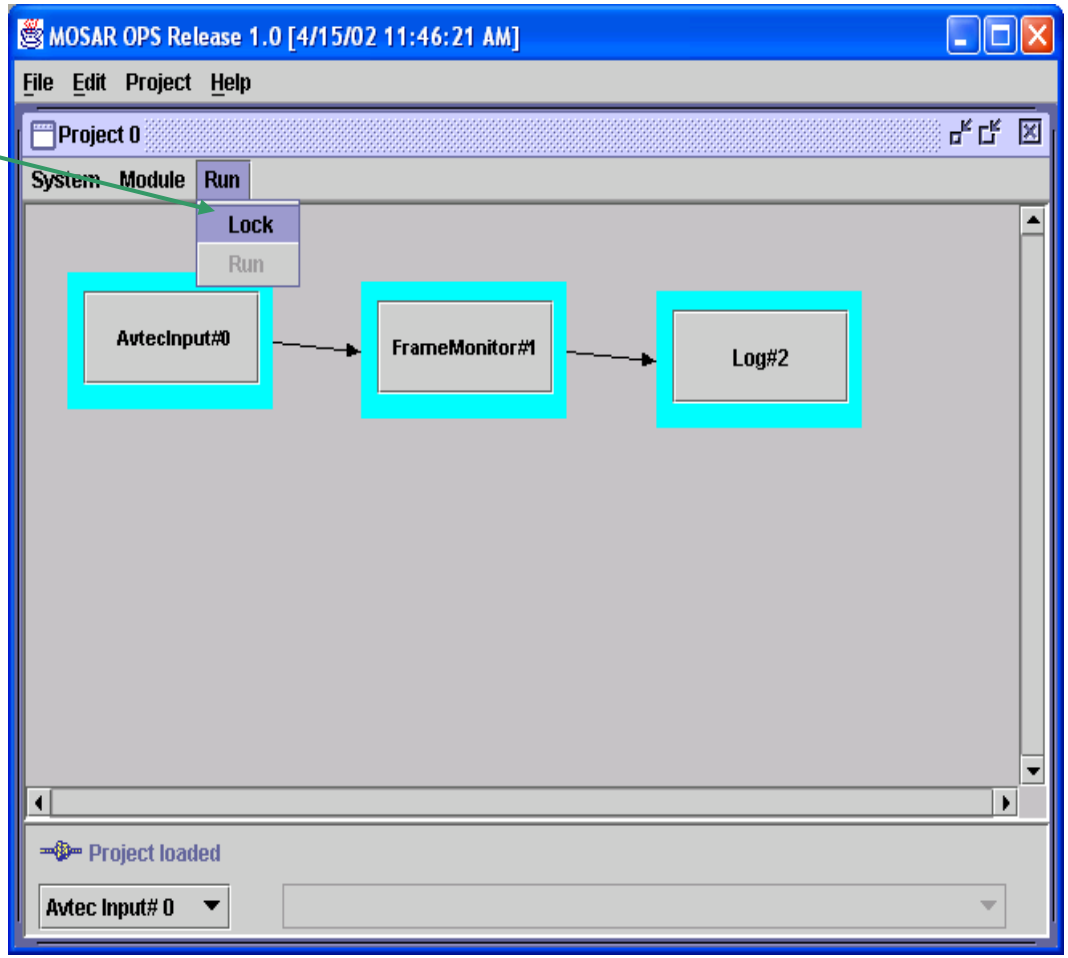
- Configure the modules using the configuration menus access from the drop down displays.
- Refer to the Users Guide and the Module notes for further information.

Running the Project

- After the modules have been added, the links between the modules made, and the modules configured you are ready to run the project.

Running the Project

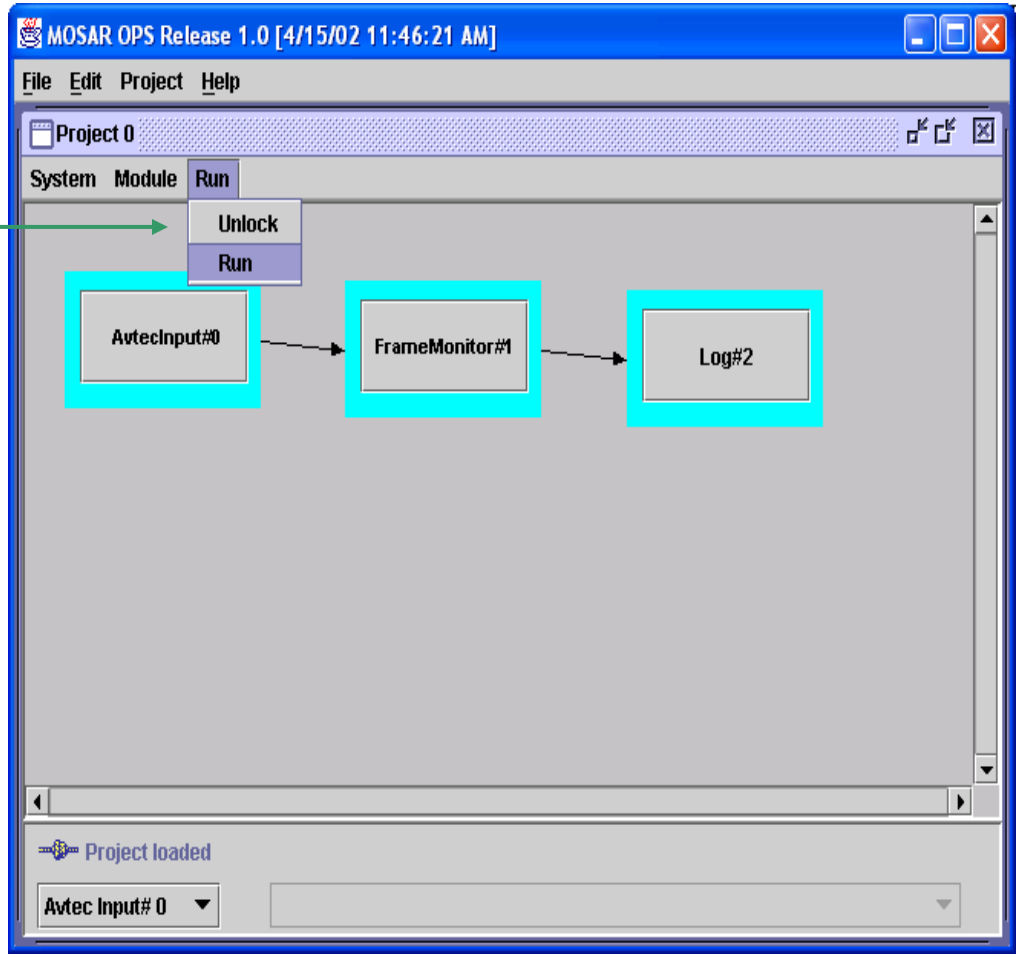
The first step is to click on **Run.** This will open the drop down menu. Select **Lock**. This will lock the project



Running the Project

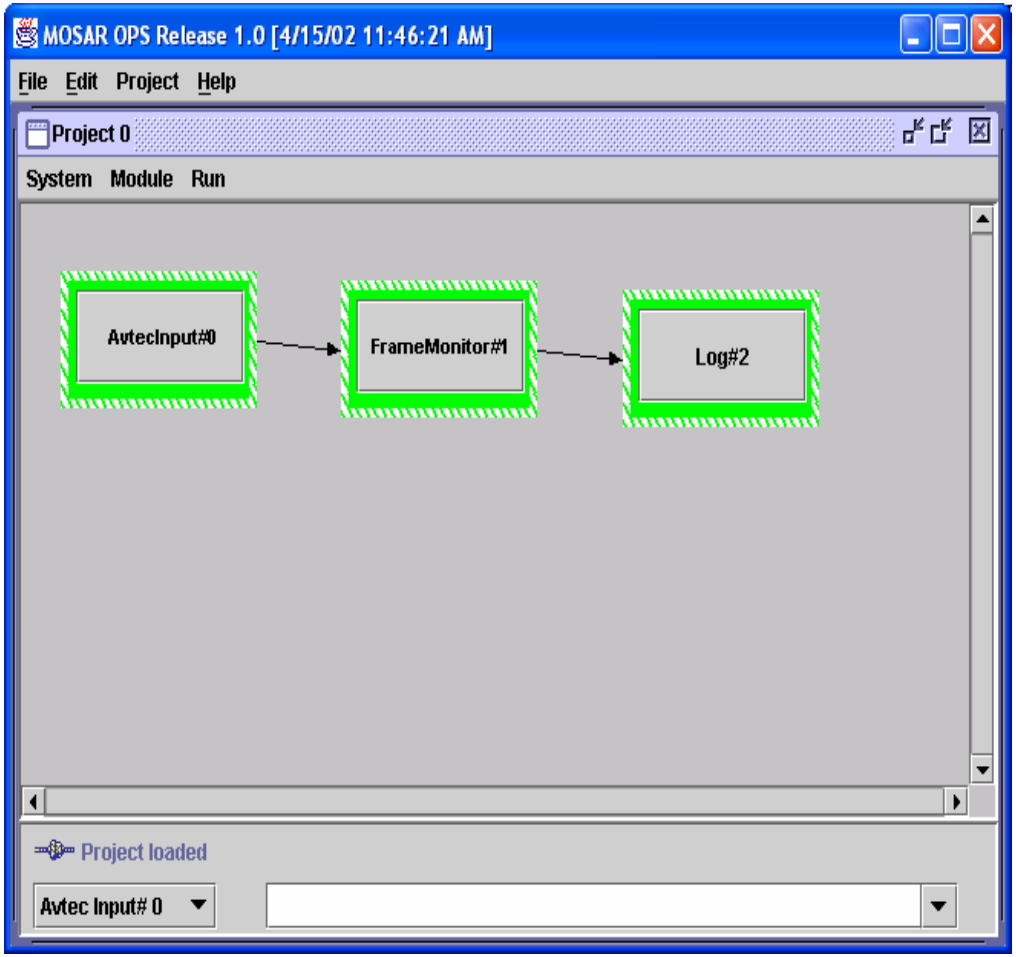
After locking the project, select **Run**. The drop down menu will open and the **Lock** will be replaced by **Unlock**. The modules can still be configured in this mode but the user can not add or remove modules or links while the project is locked.

When the user is ready clicking on **Run** will take the project to run mode.



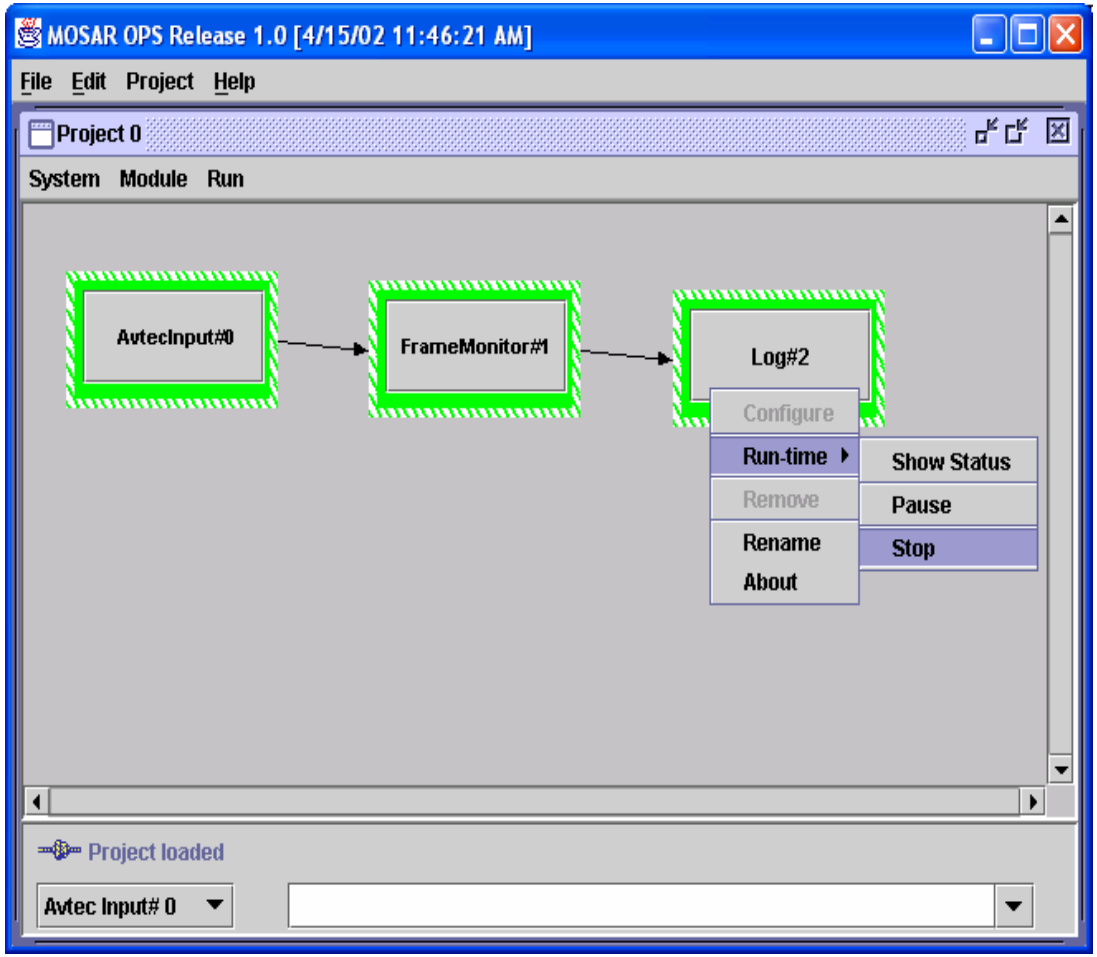
Running the Project

When the project is in run mode, the module boxes outline will change to green.

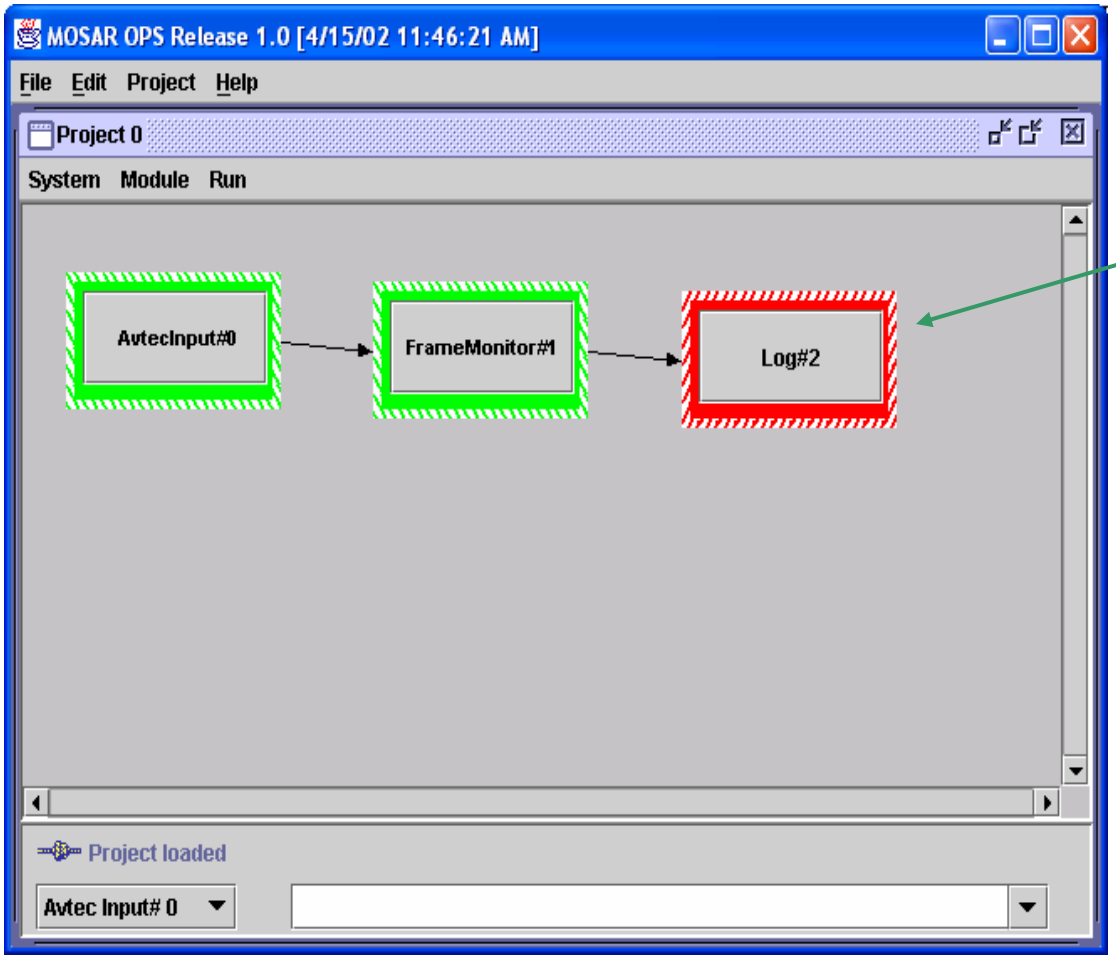


Running the Project

You can stop individual modules by accessing the drop down menu and clicking on **STOP.**

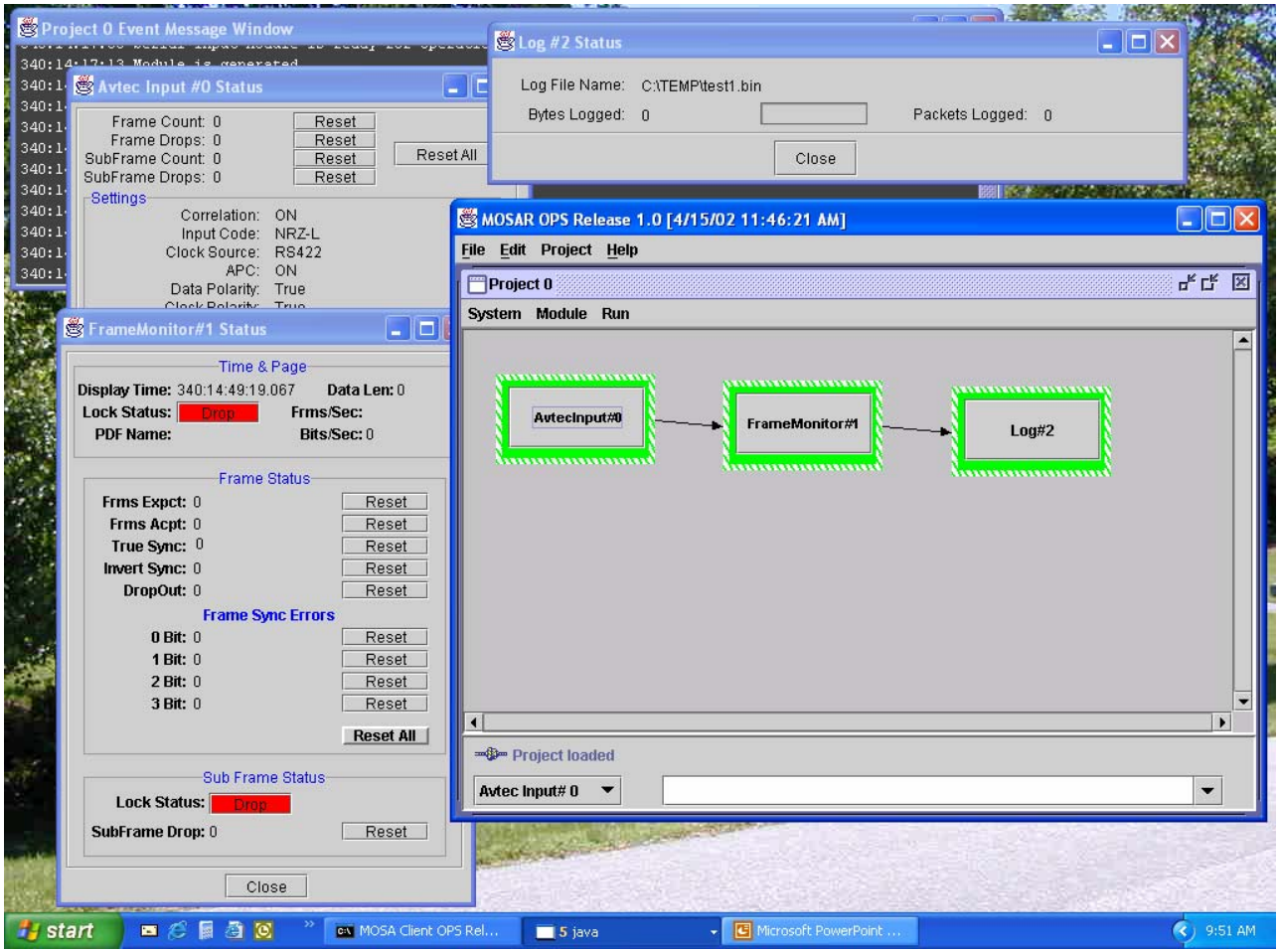


Running the Project



When an individual module is stopped the module outline turns red.

Running the Project

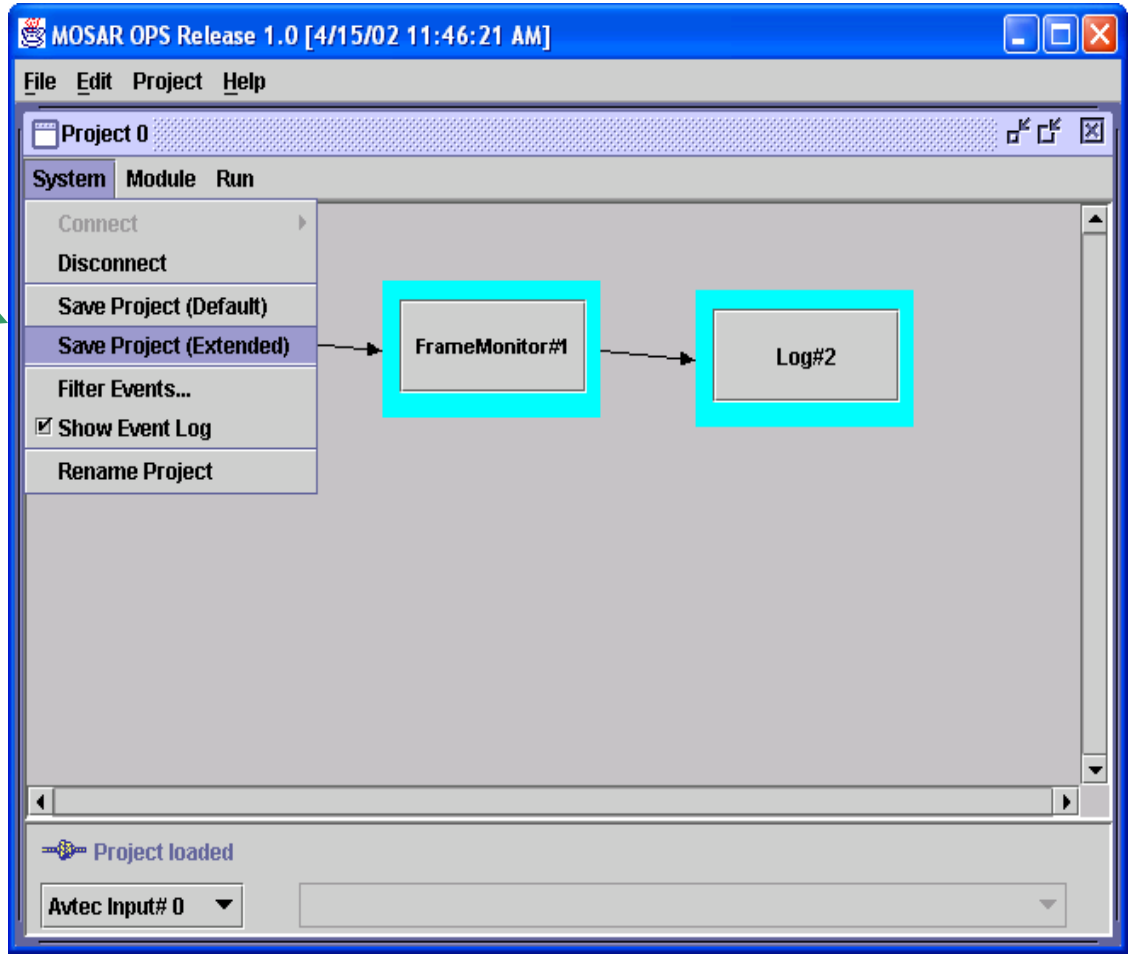


With the project in Run mode the user can open the desired status displays.

Saving the Project

To save a project it must be stopped and unlocked.

Click on **System**. Select the **Save Project (Extended)**. This is a more flexible and reliable save method.



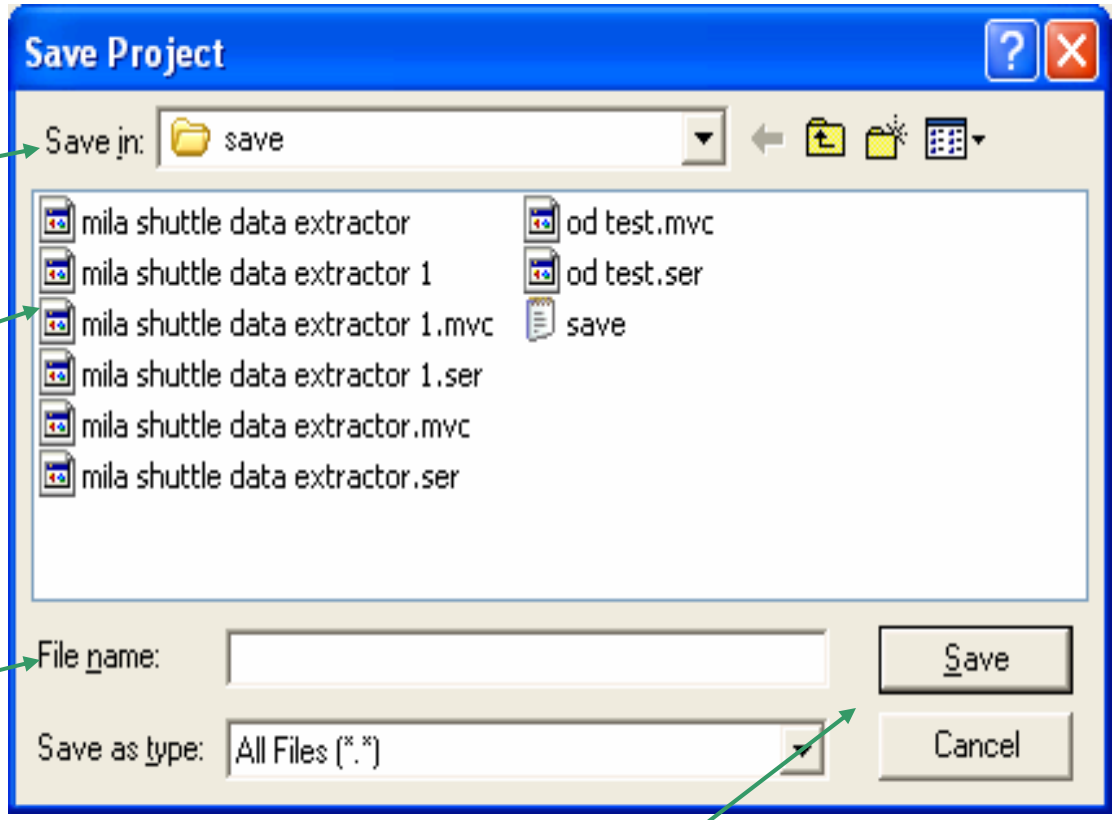
Saving the Project

The Save Project Window will open

Directory the project will be saved in

Previously saved projects. Note: each saved project creates 3 files.

Enter the name that you wish to use to save the project.



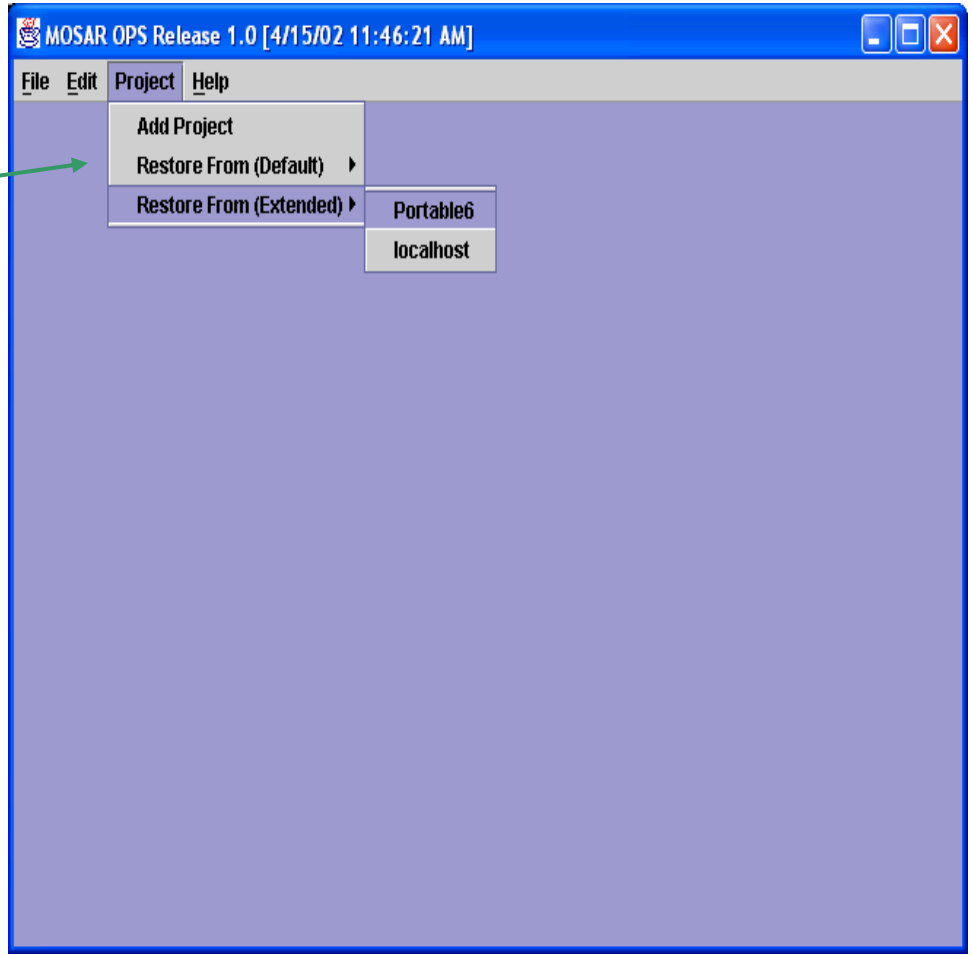
After the file name is entered click on the **Save** button

Restoring a Project

Select **Project**. If the project was saved using the extended mode, select **Restore from (Extended)**.

The system allows for the Client and Server to be ran on separate machines. If this option is being used then multiple names will appear.

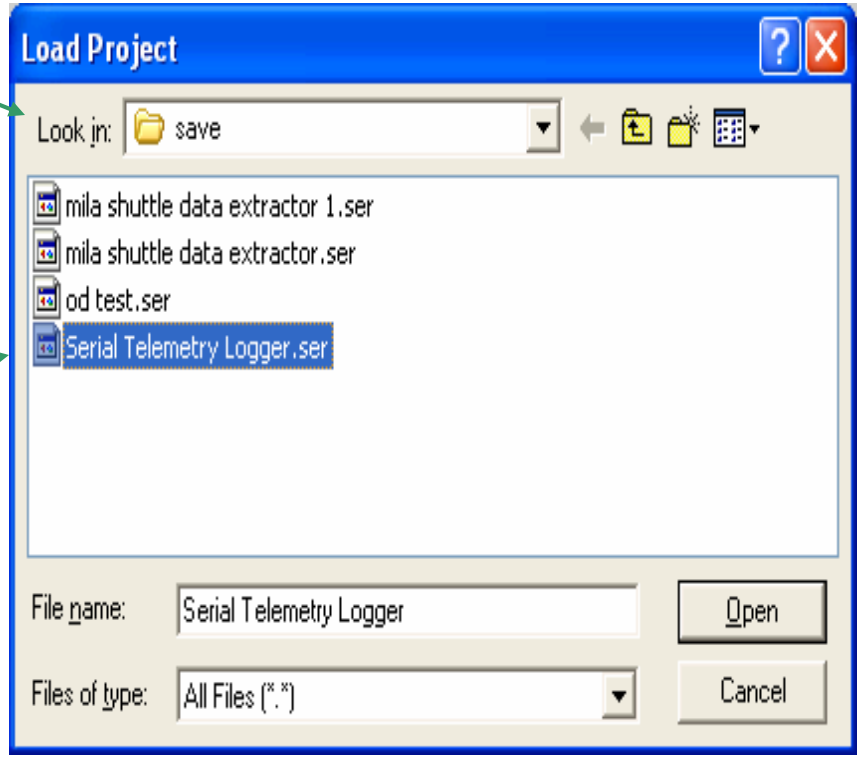
These names are defined in the **Servers.txt** located in the Properties subdirectory of the Client software.



Selecting the Project

Directory selected. Use the pull-downs to change directories

Select the project you wish to restore. It will be highlighted when it is selected. Click on **OPEN** to restore the project.



Restoring a Project

Name and Location of the project loaded.

All that is required to run the project is to go to **Run** and **Lock** the project. Then go to **Run** and click on **Run** on the drop down menu.